OPERATING AND SERVICE INSTRUCTIO
WITH PARTS LIST

DIGITAL TO
SYNCHRO/RESOLVER CONVERTER
MODEL 538 S- S-2234

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OPERATING AND SERVICE INSTRUCTIONS
WITH PARTS LIST

DIGITAL TO SYNCHRO/RESOLVER CONVERTER MODEL 538 S- S-2234

BOTH UNITED STATES AND FOREIGN PATENTS ARE PENDING FOR A NUMBER OF CIRCUITS USED IN THIS INSTRUMENT

MANUFACTURED BY:

NORTH ATLANTIC INDUSTRIES, INC.
200 TERMINAL DRIVE
PLAINVIEW NEW YORK

CODE IDENTIFICATION 07342

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TABLE OF CONTENTS

SECTION I - INTRODUCTION AND DESCRIPTION

1.1	Introduction and Description	1.1
1.2	General Specification	1.2

SECTION II - PREPARATION FOR USE

2.1	Unpacking	2.1
2.2	Mounting	2.1
2.3	Connections	2.2
2.4	Initial Checkout	2.2

SECTION III - OPERATING INSTRUCTIONS

3.1	Precautionary Measures	3.1
3.2	Turn-On Procedures	3.2
3.3	Operating Procedure	3.2

SECTION IV - THEORY OF OPERATION

4.1	Theory of Operation	4.1
4.2	Conventions	4.4

SECTION V - MAINTENANCE

5.1	Routine Maintenance	5.1
5.2	Inspection	5.1
5.3	Performance Evaluation Test Procedure	5.2
5.4	Troubleshooting	5.5
5.5	Degaussing	5.9
5.6	Special Tools	5.11

SECTION VI - PARTS LIST

SECTION VII - SCHEMATICS

SECTION VIII - ASSEMBLIES

SECTION IX - APPENDIX

Warranty
Sales Representatives

LIST OF ILLUSTRATIONS

FIGURE NO.	DESCRIPTION	PAGE
1.1	Model 538, Digital to Resolver/Synchro Converter	
2.1	Model 538, Mechanical Dimensions	2.3
4.1	System Block Diagram	4.3
4.2	Synchro Transmitter (at EZ) - CX	4.5
4.3	Rotor Excited Resolver	4.6
4.4	Model 538, Resolver Mode	4.7
4.5	Model 538, Synchro Mode	4.8
4.6	Alternate Digital to Resolver Converter Conventions	4.9
5.1	Test Setup	5.4
5.2	Logic Diagram, Trig Decoder	5.7
5.3	Switch Test Circuit	5.8
5.4	Degaussing Circuit	5.10
D-761457	Overall Schematic	
B-100601	Schematic, Trig A	
B-100602	Schematic, Trig B	
B-100647	Schematic, Trig C	
B-100604	Schematic, Interpolation A, B4	
B-100640	Schematic, Interpolation B1	
B-101163	Schematic, Mode Program	
C-100608	Schematic, Distribution Board	
D-761099	Power Supply, 45Hz	
A-100620	Assembly, Trig A	
A-100621	Assembly, Trig B	
A-100646	Assembly, Trig C	
A-100623	Assembly, Interpolation B4, A	
A-100638	Assembly, Interpolation B1	
A-101162	Assembly, Mode Program	
B-100780	Assembly, Power Supply 45Hz	
A-100794	Assembly, Power Supply Card, 45Hz	

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CAUTION

High voltage exists at several points in the instrument. Normal precautions consistent with good practice should be taken to reduce shock hazard.

A potential shock hazard exists when ungrounded power source or ungrounded case operation is employed. Persons operating the instrument should be made aware of and take precautions against this condition.

North Atlantic Industries, Inc. cannot be held responsible for damage to person or property in the process of or as a result of maintenance, calibration, or setting up of the instrument.

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SECTION I

1.1 INTRODUCTION AND DESCRIPTION

The North Atlantic Series 536, 537, and 538 Digital to Resolver and Synchro Converters provide a precision interface from digital to analog systems. These units feature high resolution and accuracy coupled with high-speed conversion through the use of unique solid-state switching circuits and precision trigonometric transformers.

All units of this series accept parallel digital input data in the form of binary angle. Input storage and strobe circuitry are featured to eliminate the effects of noise on the digital input lines to enable the use of these instruments in a multichannel multiplexed system.

Most frequently these units are used in systems requiring the conversion of binary data from a computer to synchro or resolver information to be used in positioning servo readouts, instruments antennas, and so forth.

1.0 ELECTRICAL SPECIFICATION

1.1 Code: Straight Binary

1.2 Program: Parallel, 14 bits uncomplemented

1.3 Logic Levels: True: +5V ± .5V at 10ma
False: 0V ± 1.0V-0V at 3.2ma

1.4 Strobe: Length - 4 μ sec ± 1 μ sec
True - +5V ± .5V at 27ma
False - 0V +1
=0V at 1.6ma

1.5 Rsv/Synchro Command: RSVR =
SYN =

1.6

L-L Logic	Logic 2	Logic 1	
11.8V	0		0=0V +1.0V
26V	0	1	>0V at 2
90V	1	1	1=+5V ±0.5V at 2

1.7 Output Voltage: 11.8V L-L, 26V L-L, and 90V L-L. (For remote programming, Ref. Level switch must not be in the "off" position)

1.8 Reference Command: 115V REF = 0; 26V REF = 1

1.9 Resolver Conventions: In accordance with MIL R-21530

1.10 Synchro Conventions: In accordance with MIL S-20708A

1.11 Frequency Range: (within accuracy) 400Hz ±5%

1.12 Accuracy (Static) ±1 ARC minute

1.13 Conversion Time: 4μsec max. following trailing edge of strobe.

1.14 Settling Time: 100μ sec max.

1.15 Resolution: $\pi/2^{14}$ radians (39.55 sec) or 2^{15} turns.

1.16 Reference Excitation: 115V ± 10%, 400Hz ± 5% or 26V ±10% 400Hz ±5%

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1.17 Power Excitation: 115V ± 10%, 45 Hz to 420Hz, 25VA.

1.18 Absolute Maximum Load:

Resolver	11.8V L-L	65 ohm
	26V L-L	310 ohm
	90V L-L	6.1 KΩ
Synchro	11.8V L-L	50 ohm
	26V L-L	235 ohm
	90V L-L	4.6 KΩ

2.0 FRONT PANEL CONTROLS

2.1 Remote/Local: For mode programming in the "remote" position the other mode switches are disabled and the unit may be programmed in accordance with the above.

2.2 RSVR/SYN: Selects resolver or synchro mode of operation.

2.3 L-L Level: Selects 11.8V, 26V or 90V Line to Line levels in either synchro or resolver mode.

2.4 Power Switch & Indicator

2.5 Reference Switch & Indicator

2.6 Reference Switch : Selects off, 26V or 115V reference.

2.7 Reference Indicator: Illuminated when in either 26V or 115V position.

2.8 Resolver Synchro Output Test Terminals: Four 5-way binding posts.

2.9 Reference Test Terminals: Four 5-way binding posts

* For remote programming of reference, the reference switch on the front panel must NOT be in the "off" position.

3.0 CONNECTOR LIST

3.1 Digital Input Connector: J1 MS 3102A-24-28P

PIN		
	A	$\overline{11}/2^0$ (2^{-1})
	B	$\overline{11}/2^1$ (2^{-2})
	C	$\overline{11}/2^2$ (2^{-3})
	D	$\overline{11}/2^3$ (2^{-4})
	E	$\overline{11}/2^4$ (2^{-5})
	F	$\overline{11}/2^5$ (2^{-6})
	G	$\overline{11}/2^6$ (2^{-7})
	H	$\overline{11}/2^7$ (2^{-8})
	J	$\overline{11}/2^8$ (2^{-9})
	K	$\overline{11}/2^9$ (2^{-10})
	L	$\overline{11}/2^{10}$ (2^{-11})
	M	$\overline{11}/2^{11}$ (2^{-12})
	N	$\overline{11}/2^{12}$ (2^{-13})
	P	$\overline{11}/2^{13}$ (2^{-14})
	R	Spare
	S	Spare
	T	Spare
	U	Digital Common
	V	Spare
	W	Spare
	X	Spare
	Y	Strobe
	Z	Spare

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3.2 Analog Output Connector: J2 MS3102A-20-7S

Pin A - Resolver S1
B - Resolver S3
C - Resolver S2
D - Resolver S4
E - Synchro S1
F - Synchro S2
G - Synchro S3

3.3 Input Power Connector : J3 MS3102A-20-7P

Pin A - 115V, Power
B - 115V, Power Return
C - Frame ground
D - 115V, 400Hz Ref.
E - 400Hz Reference, Return
F - 26V, 400Hz Reference
G - Spare

3.4 Mode Programming Connector: J4 MS3102A-20-7PW

Pin A - Rsvr/Synchro Logic
B - L-L Logic 1
C - L-L Logic 2
D - Spare
E - Reference Select
F - Spare
G - Digital Common

4.0 FUSE LIST - ALL ARE TYPE 8 AG

F1 115V Power 1a
F2 +4VDC 3A
F3 +5VDC 1A
F4 -12VDC 1/2A
F5 +24VDC 1/2A

5.0 PANEL FINISH: Gray #26440 per FED. STD. 595. With black marking #27038 per FED. STD. 595.

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SECTION II

PREPARATION FOR USE

2.1 UNPACKING

Other than usual care in handling any precision instrument, no special precautions need be taken when unpacking the Model 536, 537, or 538. After unpacking retain the special packing material for possible use in reshipment.

2.2 MOUNTING

There are two basic physical configurations used in the 536, 537, and 538 series of Converters -- rack mounting and "Black Box".

Except for special variations as required by customer applications, all rack models of the 536, 537, and 538 series are mounted to a standard 5-1/4" x 19" panel. (See Figure 2.1 for mechanical dimensions.) This allows their installation into any standard relay rack-type cabinet. Sufficient space should be allotted above and below the instrument to allow convection cooling. In permanent installations, it is desirable to remove top and bottom covers in order to assist cooling.

The rack mounting units also lend themselves to bench applications. Many programmable units have front panel controls to facilitate manual programming. In bench applications, it is required that sufficient space be allotted above and below the instrument to allow ventilation. It is essential to leave the covers in place when using the instrument in bench applications to prevent inadvertent damage being done to the instrument by objects which may fall inside.

Model 536 and 537 Converters are also available in "Black Box" form. These instruments are intended to be surface mounted within the customer's system. Sufficient space should be allocated at the sides and top of the instrument to facilitate convection cooling.

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2.3. Wiring Recommendations

The specifications listed in Section I refer to electrical input and output requirements as measured at the rear panel connectors. Special care should be taken in system wiring to insure that digital input signals are not deteriorated due to excessive cabling capacity and inductance. When these instruments are used to drive relatively low impedance resolvers or synchros, the wiring for the synchro or resolver output data should be as heavy gauge as possible. In addition to this, when fairly long runs of wire are necessary, the lengths of the resolver or synchro leads should be matched. If these precautions are taken, the high level of output impedance match of these devices will be preserved. Extreme care should also be taken that a high quality digital return lead is connected to the digital input connector (J1). If this lead is missing, or if there should be large noise, transient, or pick-up signals present on this lead, the operation of the instrument may be severely impaired.

2.3.1 Power and Reference Requirements

(See Section I, General Specifications.)

2.4 INITIAL CHECKOUT

Perform a general visual inspection of the instrument. View front panel for signs of damage to binding posts and controls. Check the condition of the fuses and connectors on the rear panel. Check the housing and all attaching screws for security. If the instrument passes this inspection, it can be installed and placed into use. After initial installation, check the performance of the unit in accordance with the performance evaluation test procedure given in Section 5.3.

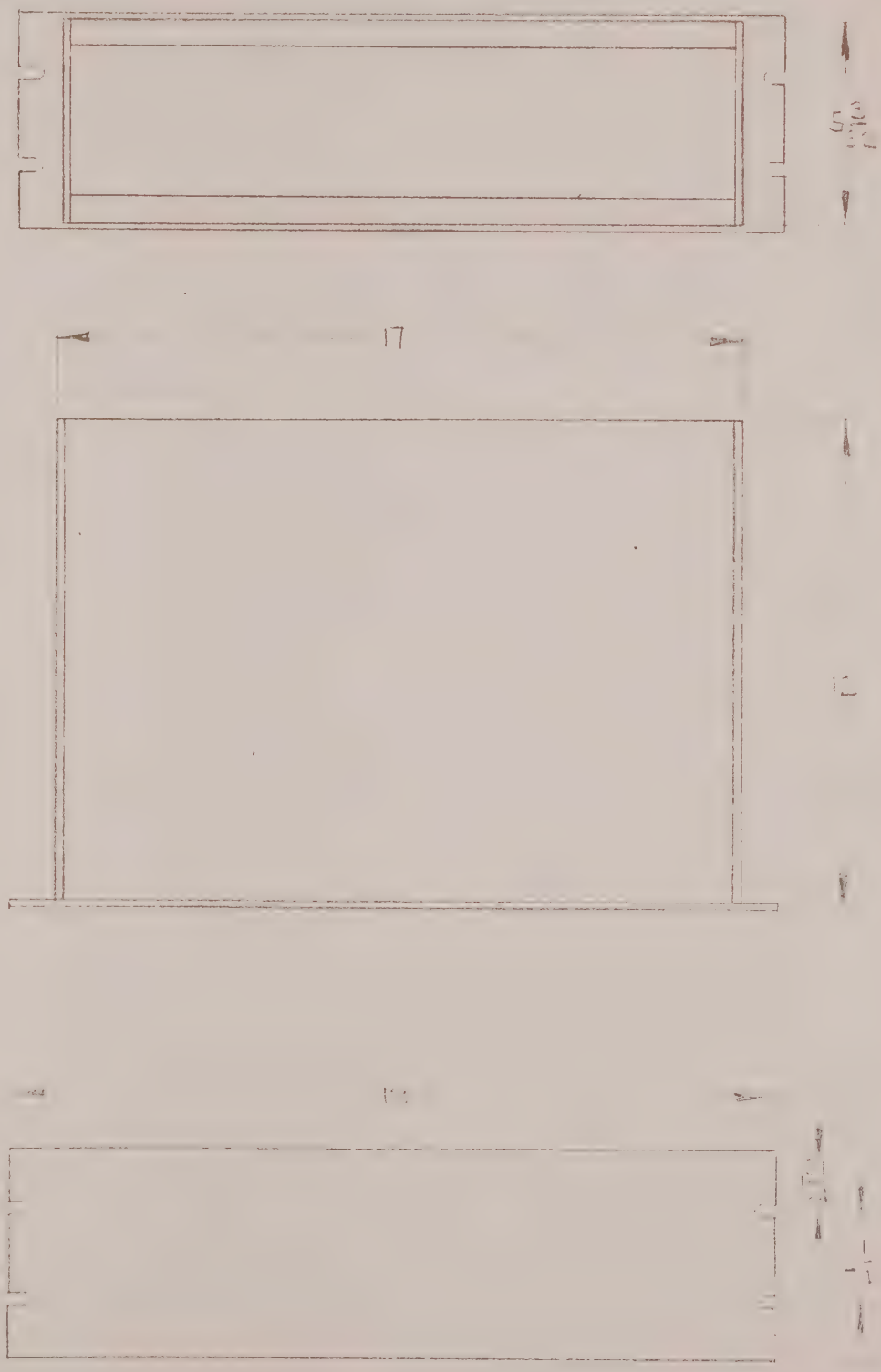

Fig. 2.1

SECTION III

OPERATING INSTRUCTIONS

PRECAUTIONARY MEASURES

3.1 In order to ensure proper operation of this equipment, the following precautionary measures must be observed:

3.1.1 Never, under any circumstances, should this equipment be operated with any of the cards or modules removed. Doing so might cause extensive damage to the solid-state switching circuits and precision analog transformer assemblies.

3.1.2 Extreme care should be used when troubleshooting to assure that DC current is not applied to the precision analog transformer assemblies. The DC current obtained from an ordinary ohmmeter is sufficient to impair the accuracy of these devices. If DC is inadvertently applied, the transformer may be degaussed as described in Section V, Maintenance.

3.1.3 Reference Voltage - Care should be taken to insure that the reference voltage applied to this unit is within the frequency and voltage level limits as described in the specifications section. Should the voltage level be exceeded, a reference level sensing circuit will prevent damage to the unit by causing the input current limiter to operate. Should this take place, the reference voltage level should be reduced to the proper level. If the level is now within the specified limits, the unit can be considered operative.

3.1.4 Output Overload - Care should be taken that the synchro or resolver load applied to the output terminals of this device does not exceed that specified in the specification section. This unit is equipped with an output current limiting circuit. Should the output current exceed the specified limits, this circuit will limit the output producing a clipped waveform. Upon removal of the overload, the output waveform will be restored to its normal condition.

3.2 TURN-ON PROCEDURE

Step (1): Insure that all proper data reference and power connections have been made.

Step (2): Turn on power by means of the front panel switch. (In the case of "Black Box" units, there is no power switch; therefore, the switching must be done by auxiliary equipment located in the customer's system.) Apply reference by the use of the front panel switch. (In the case of the "Black Box" unit, the reference must be switched with auxiliary equipment located in the customer's system.) To turn the unit off, first turn off the reference. and then the power.

3.3 OPERATING PROCEDURE

3.3.1 Turn unit on as described above.

3.3.2 For mode programmed units, select the mode of operation (Resolver/Synchro and Line-to-Line Level) by means of the front panel switches, when in the local mode, or by means of the system programming equipment when in the remote mode of operation.

3.3.3 Connect the resolver or synchro load which will be driven to the proper output terminals.

3.3.4 Operate the device being used to generate digital data such that the digital angle is presented to the instrument and a strobe is generated.

3.3.5 Observe the operation of the synchro or resolver devices being driven to insure that the system is operating properly. It would be desirable at this point to monitor the output lines with a Resolver/Synchro Bridge to check the accuracy of the data being generated.

SECTION IV

THEORY OF OPERATION

4.1 THEORY OF OPERATION

The basic function of a Model 536, 537, or 538 is to convert binary data representing an angle between 0 and 360° to an equivalent resolver or synchro analog output. This is performed in the following manner (please refer to Figure 4.1, System Block Diagram).

A binary word of the appropriate resolution is presented to the input data connector. When required by the specific application, this data passes through optional level conversion circuits. In most instances, however, these circuits are not necessary and, therefore, are not used. The data is then brought through a stage of inversion for purposes of creating complements. The data and its complements are then brought to a set of strobed gates. A strobe command, generated by the customer, is used to indicate that the input data is valid and that conversion should be initiated. This strobe is connected to a strobe discriminator circuit. The purpose of this circuit is to prevent accidental or illegitimate strobing of digital input data. The output of the strobe discriminator, identified as the "gated strobe", is connected to the strobe gating circuits previously mentioned. The presence of a gated strobe allows the binary data and its complements to pass through these gates. The outputs of these gates are connected to the set and reset terminals of the flip flops in the storage section. This section stores the digital data which has been presented to the equipment. Once stored, the data may be removed from the input lines and the computer or other device which had generated the data may be used for other functions. The output of the storage section connects to the logic circuits which decode from the binary form to a form of logic which is applicable to transformer tap selection. The output of this section connects to the solid-state switches which are used to select taps on the precision tapped transformers.

The transformer assembly is excited by the AC reference potential which has been supplied by the customer. The taps selected are trigonometrically weighted so as to perform a digital to

sine and cosine analog conversion. In the case of Digital to Resolver Converters, the sine and cosine weighted analog signals pass through Output Isolation and Scaling Transformers and become the resolver output data. In the case of a Digital to Synchro Converter, an equivalent set of output transformers perform an additional function of resolver to synchro data conversion. Multi-mode units (538) contain output transformers which perform the above-mentioned functions as well as a programmed scaling function to allow for a multiple line-to-line level selection.

The selection of the appropriate transformers in changes of mode is performed by the Mode Programming Module. This module receives as its input the mode programming digital data from the customer's equipment.

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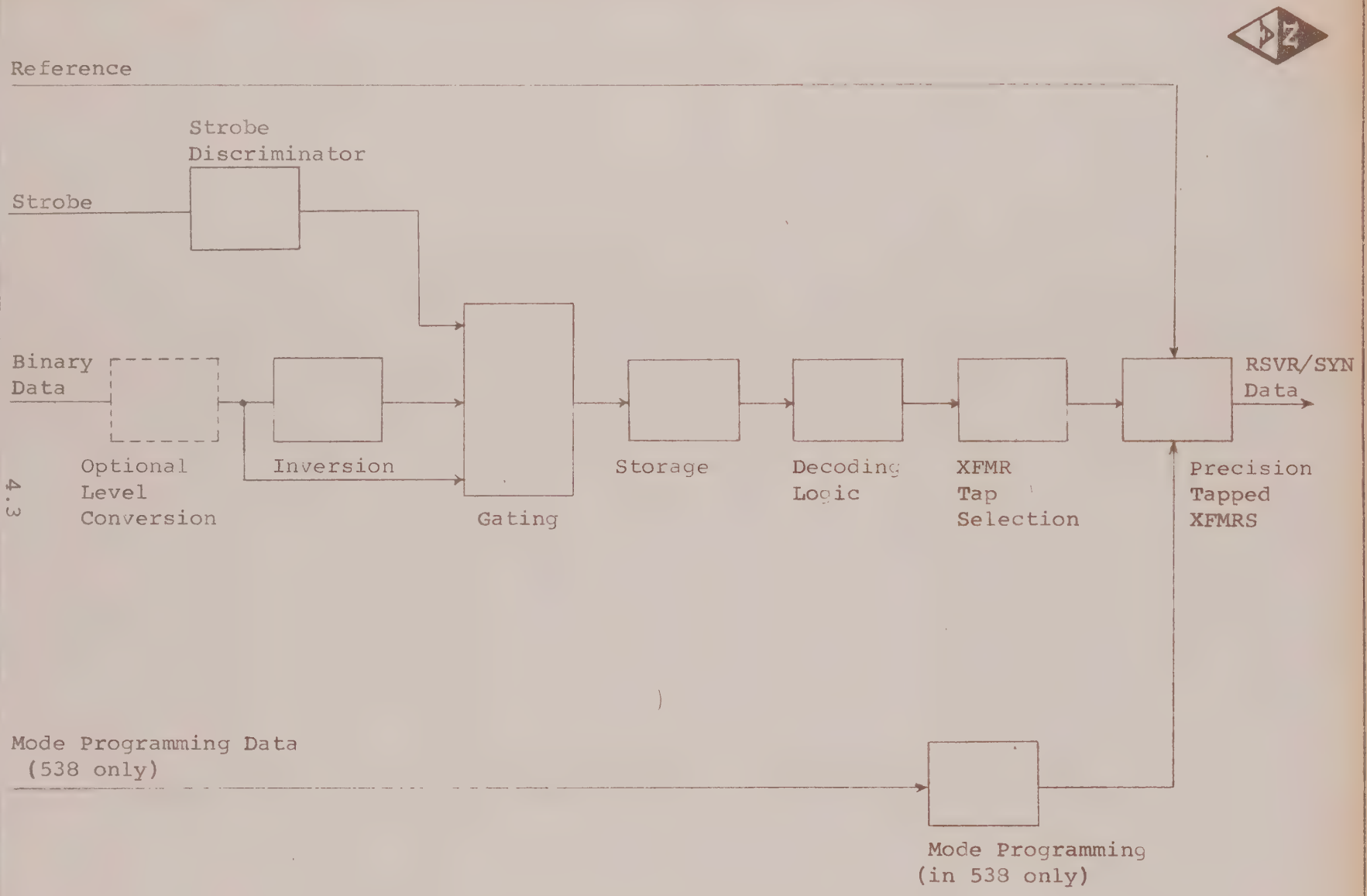


FIGURE 4.1
MODELS 536, 537, 538 SYSTEM BLOCK DIAGRAM

4.2 CONVENTIONS

Conventions for polarities, terminal designation, and direction of shaft rotation for synchros and resolvers are most frequently defined in accordance with military specifications MIL-S-20708A (synchros) and MIL-R-21530 (resolvers).

North Atlantic Digital to Resolver/Synchro Converters all have terminal designations and electrical characteristics consistent with these same specifications. Thus, a 536, 537, or 538 is used as though it were a transmitting component, such as a CX or RX.

In applying the conventions, caution must be exercised that:

1. The manufacturer of the synchro or resolver followed the MIL-spec conventions.

2. System use of the component has not dictated a change in convention in order to achieve a different characteristic such as direction reversal or mechanical shaft offset.

4.2.1 Synchro Transmitter Conventions

Synchro Transmitter (CX)

The equations describing an ideal Synchro Transmitter (CX) apply as well to all Series 537, 538 Converters.

$$E_{(S1-S3)} = NE_{(R2-R1)} \quad \text{Sin } \theta$$

$$E_{(S3-S2)} = NE_{(R2-R1)} \quad \text{Sin } (\theta + 120°)$$

$$E_{(S2-S1)} = NE_{(R2-R1)} \quad \text{Sin } (\theta + 240°)$$

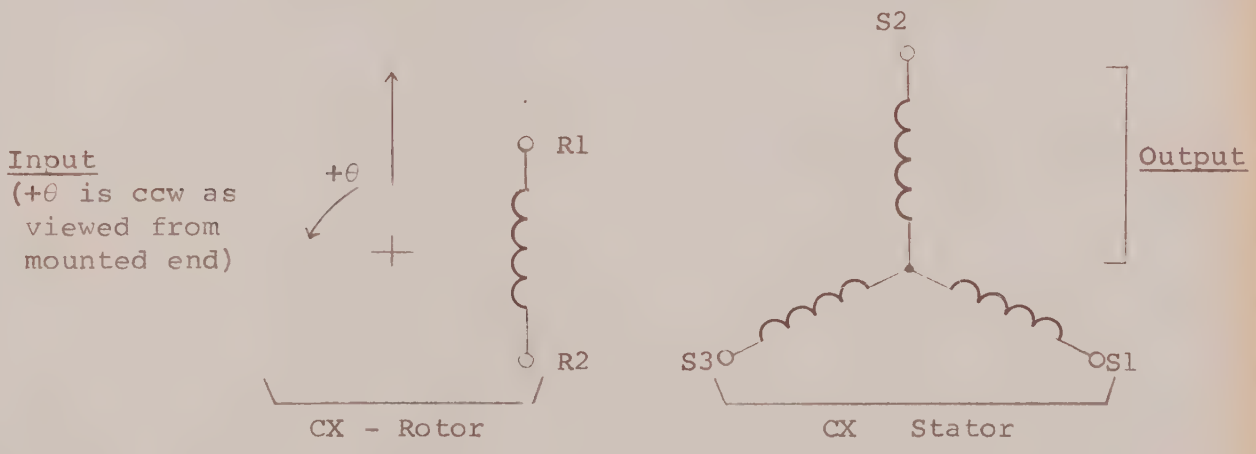
Where: $E_{(R2-R1)}$ is the voltage between rotor leads R2 and R1

$E_{(S3-S2)}$ is the voltage between stator leads S3 and S2. Other voltages are similarly defined.

N is the ratio of the maximum rms voltage between the secondary terminals (stator) and the primary rotor voltage.

θ is the shaft angle displacement from electrical zero which satisfies these equations.

The schematic representation for a Synchro Transmitter (CX) is shown below in Figure 4.2.



NOTE: Synchro is shown at $\theta = E_Z$ (electrical zero). This is defined as that angle for which coupled voltage between the rotor and E(S1-S3) is a minimum and E(S2-S3) is in phase with E(R1-R2)

FIGURE 4.2 - Synchro Transmitter (at EZ) - CX

4.2.2 Resolver Conventions

Resolver Transmitter (RX) and Differential Resolver (RD)

The equation describing an ideal resolver applies as well to all Series 536 and 538 Converters.

For Rotor Energized Resolvers:

$$E_{(S1-S3)} = NE_{(R1-R3)} \cos\theta - NE_{(R2\ R4)} \sin\theta$$

$$E_{(S2-S4)} = NE_{(R2-R4)} \cos\theta - NE_{(R1-R3)} \sin\theta$$

For Stator Energized Resolvers:

$$E_{(R1-R3)} = NE_{(S1-S3)} \cos\theta + NE_{(S2-S4)} \sin\theta$$

$$E_{(R2-R4)} = NE_{(S2-S4)} \cos\theta - NE_{(S1-S3)} \sin\theta$$

Where: Symbols have meaning defined above.

The schematic representation for a Resolver Transmitter (RX), Resolver Control Transformer (RC), or a Differential Resolver (RD) with the rotor excited is shown below in Figure 4.3. Input and output can be reversed for stator excited schematic.

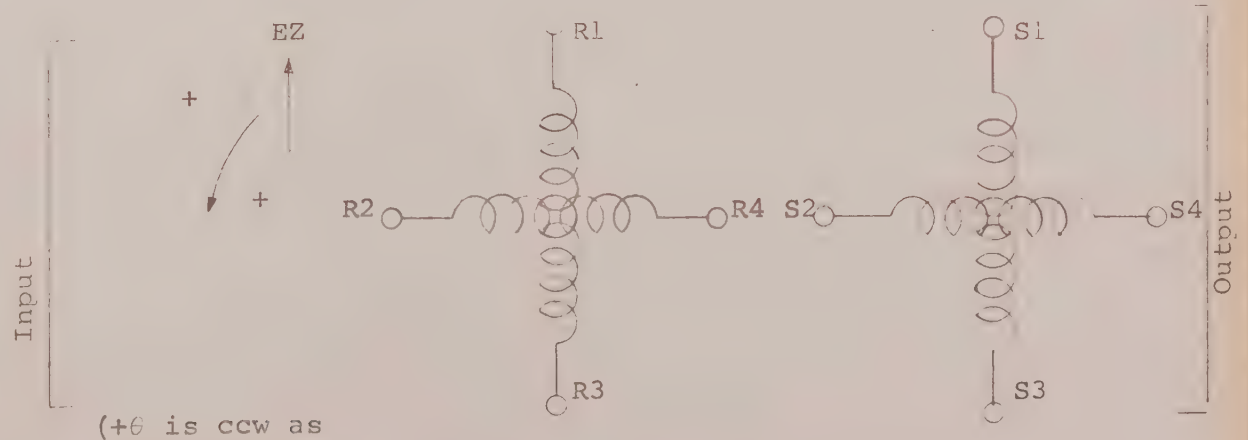


FIGURE 4.3 - Rotor Excited Resolver at EZ, RX, RC, or RD

NOTE: Resolver is shown at θ = EZ (electrical zero). This is defined as minimum coupling from (R1-R3) to (S2-S4) for rotor excited case. For stator excited resolver EZ is defined for minimum coupling from (S1-S3) to (R2-R4).

Digital to Resolver Converter

The input and output terminals of a North Atlantic Series 536 and 538 Converters are analogous to those of a rotor excited Resolver Transmitter (RX). The connections which correspond to those shown in the diagram of Figure 4.3 are illustrated below in Figure 4.4 for a Model 538 Converter in the Resolver Mode.

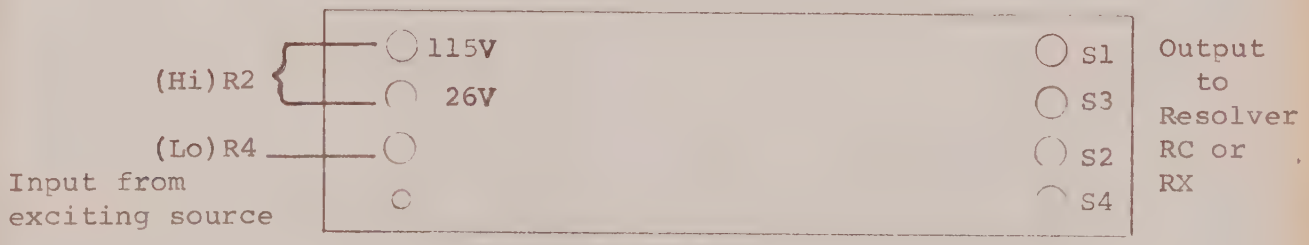


FIGURE 4.4 - Model 538 Converter, Resolver Mode

Digital to Synchro Converter

The input and output terminals of the North Atlantic 537 and 538 Converters correspond to the above diagram and are indicated below in Figure 4.5.

Input
From exciting Source

Output
To Synchro CT or CDX

FIGURE 4.5 - Model 538 Converter, Synchro Mode.

ALTERNATE DIGITAL TO RESOLVER CONVERTER CONVENTIONS

(ALL ASSUME CCW IS POSITIVE ROTATION)

FIGURE 4.6

MODEL 538 CONVERTER - RESOLVER MODE

SECTION V

MAINTENANCE

5.1 ROUTINE MAINTENANCE

With the exception of relays (in Model 538 Mode Programmed Units) and printed circuit board connectors, the solid-state logic and switching circuits and passive precision transformer elements contain no moving parts and require no routine maintenance.

5.1.1 Relays

The relays used in the Mode Programmed Units perform functions in extremely low duty cycle applications. The relay contact surfaces may be periodically inspected and cleaned (see Section 5.2 for inspection information). The contact areas may be cleaned with a good commercial solvent such as Dow Clene WR. The frequency of this cleaning operation is largely dependent upon the conditions of use of the equipment. In cases where the equipment is used in an extremely dusty environment and when mode changes are very frequently made, it is recommended that the cleaning operation be done on a bi-monthly basis. In most applications, a semi-annual inspection and cleaning is sufficient.

5.1.2 Logic Cards

Should inspection indicate that logic card connector fingers require cleaning, they may be cleaned using the same solvent described above.

5.2 INSPECTION

In Mode Programmed Units, the relay contact areas require inspection and cleaning as described above. The relay board contact areas should be inspected for excessive wear. Wear in these areas will be considered excessive only in the case that

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the gold plating is worn away and copper is visible in the contact area. When this is the case, the relay board must be replaced. The relays themselves should also be inspected. When excessive relay contact wear is observed, the relay should be replaced.

5.3 PERFORMANCE EVALUATION TEST PROCEDURE

The North Atlantic Model 536, 537, 538 series of instruments contain solid-state logic and switching circuits and passive precision transformer elements and thus require no calibration adjustments. Since there are no elements within the equipment that change characteristics or drift with age, the equipment may be expected to remain within rated accuracy indefinitely. It is recommended, however, that a periodic test program be followed to insure that there has been no malfunction of any of the components in the equipment which might affect its accuracy. The following is a detailed test procedure which may be used to accomplish this purpose.

Test Equipment Required:

1. Source of appropriate digital input data, such as North Atlantic Digital Angle Generator, Model 660.

2. Resolver/Synchro Bridge, North Atlantic Model 540 or equivalent.

3. Phase Angle Voltmeter, North Atlantic 200 or 300 Series or equivalent.

4. AC Reference Source, Powertron 250 or equivalent.

The following procedure is for a 538 Multi-Mode Unit. For Models 536 and 537 Single-Mode Units, delete all tests which do not apply.

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5.3.1 Connect the Converter to the Digital Data Source, Reference Source, and Power Source.

5.3.2 Apply power and reference.

5.3.3 Program the unit for 11.8V Resolver Mode using either local or remote programming.

5.3.4 Program the unit for 0° (0000000).

5.3.5 Using the PAV, measure the S2-S4 output (+11.8V).

5.3.6 Program the unit for 90° (01000).

5.3.7 Measure the S1-S3 output (+11.8V).

5.3.8 Program the unit for 11.8V Synchro Mode.

5.3.9 Program the unit for 30° (0001011).

5.3.10 Measure the S2-S1 output (+11.8V).

5.3.11 Program the unit for 90° (01000).

5.3.12 Measure the S3-S1 output (+11.8V).

5.3.13 Repeat Tests 5.3.3 to 5.3.12 for 26V and 90V L-L. In each case, the output should be approximately equal to the line-to-line voltage.

5.3.14 Connect the equipment as indicated in Figure 5.1.

5.3.15 In each mode of operation, program the unit and monitor the data output using the Bridge and Phase Angle Voltmeter. Program sufficient test angles to assure that the unit is functioning properly and is within specifications.

TEST SETUP

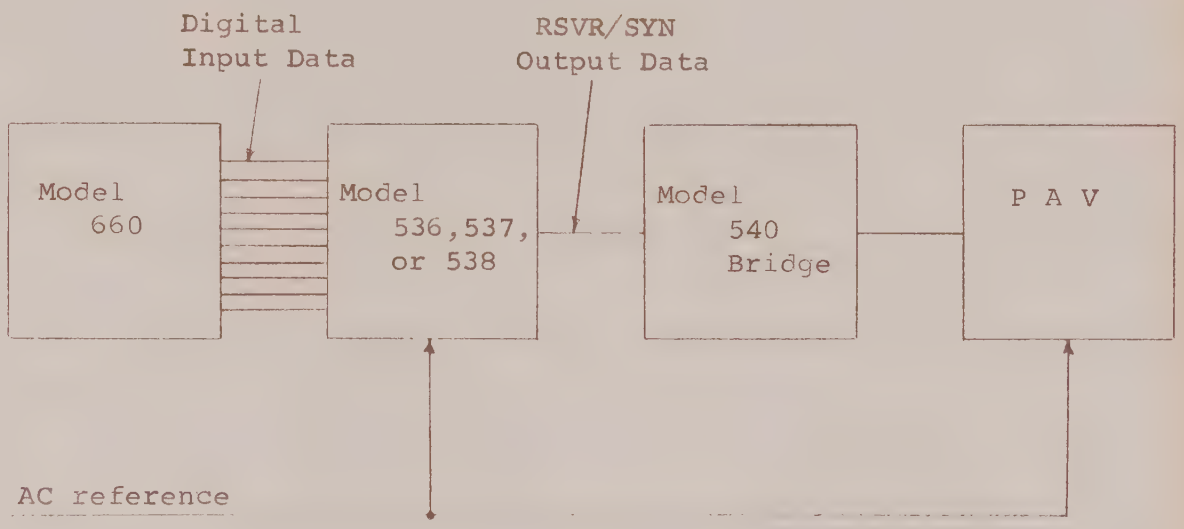


FIGURE 5.1

5.4 TROUBLESHOOTING

In the event of malfunction of this equipment, the following items should be checked before troubleshooting:

1. Are the digital input data logic levels in accordance with those specified?

2. Is the strobe input level and duration in accordance with that specified?

3. Is a high quality digital common connection to the digital input connector?

4. Has the reference voltage level been exceeded resulting in current limiting?

5. Has the analog output load been exceeded resulting in the operation of the output current limiting circuitry?

Refer to Section IV (Theory of Operation) for a general understanding of the operation of the instrument.

Troubleshooting is greatly simplified due to the modular construction of this instrument. Most of the logic cards used each perform nearly all of the required logic and switching functions for several bits of digital data. For example, interpolation A module contains inversion, stroage, decoding, and transformer switching for the 6th through 9th binary bits. Some exceptions to this are the following. Whenever level conversion is required, one card (A9) is added to the unit for the purpose of shifting the levels of all of the data bits and strobe. The Precision Transformer Assembly performs the actual conversion to analog data for all of the required bits of resolution.

All of the interpolation cards (Modules A6, A7, and A8) are identical circuit configurations. The major distinction between the various types are the type of transformer switches used and the number of bits of data handled.

Test points are located along the top edge of these modules to assist in troubleshooting. (See schematic of interpolation assembly.) Should a switch module appear to be malfunctioning, it may be tested as follows:

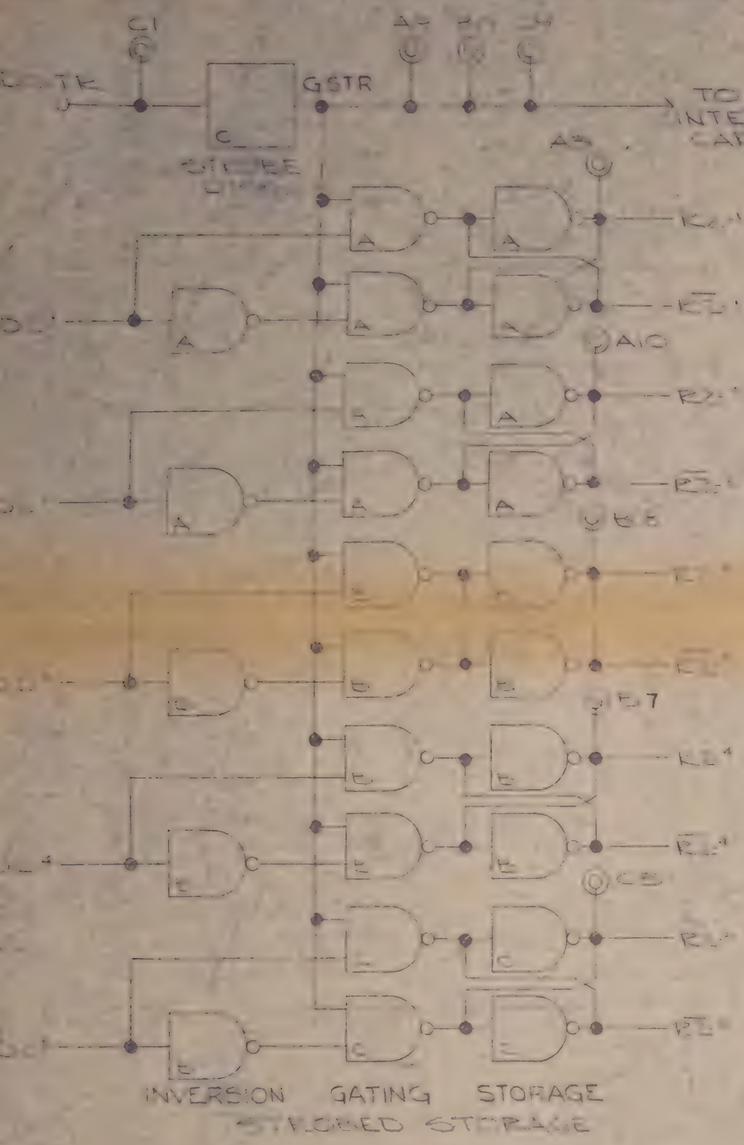
A. Isolate the Logic Board outputs by using an extender on P1 only.

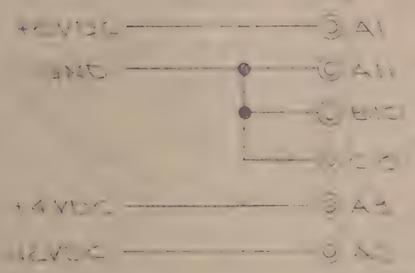
B. Apply power to the unit and insert digital data.

C. Apply the test circuit shown in Figure 5.3 to the switch output. When the switch is programmed "ON", the lamp will be lit. When the switch is programmed "OFF", the lamp will be extinguished.

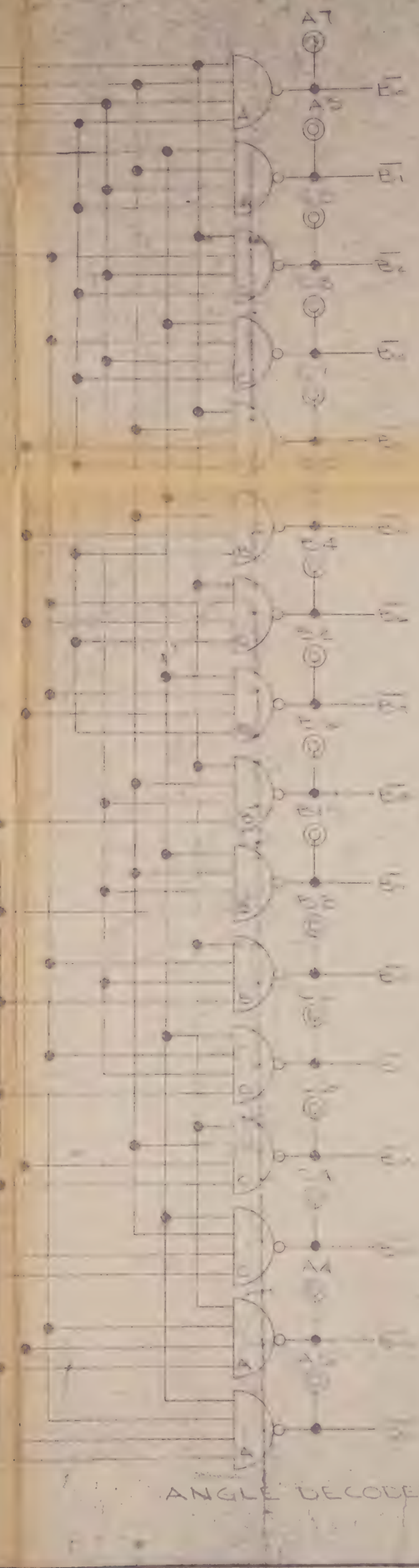
The Trig A, B, and C cards (Modules A3, A4, and A5) perform the inversion, gating, storage, logic decoding, and transformer switching functions for the first five data bits. In addition to this, the strobe discriminator circuit is located on the Trig C Card. There are many logic interconnections between the three (3) trig cards. The Trig Decoder Logic diagram (Figure 5.2) illustrates the circuits contained on these three (3) boards including interconnections. The test points indicated on the logic diagram are available along the top edge of the appropriate card. In most instances, the use of these test points will allow the determination of the location of a logic failure. Should a switch module appear to be malfunctioning, it may be tested as described above.

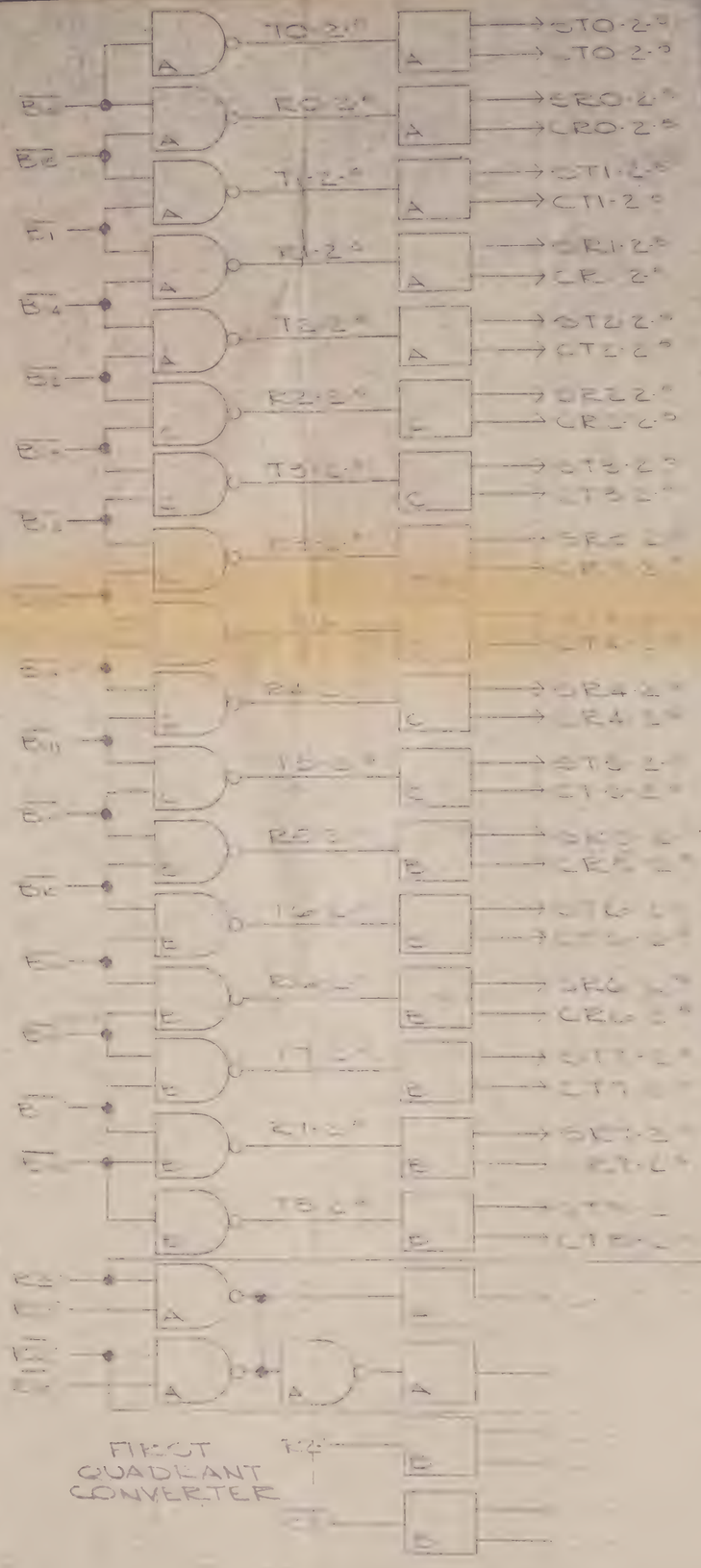
The precision transformer assembly (A1) contains all passive, inductive elements. Under normal use, this assembly will operate within its specified tolerances indefinitely. Should trouble-shooting indicate improper operation of the transformer assembly, it might be the effect of DC having been inadvertently applied. If this is so, the assembly may be degaussed in accordance with the procedure outlined below.





NOTES:
1. A = TRIG A MODULE A5
   B = TRIG B MODULE A4
   C = TRIG C MODULE A3
2. ⓐ = TEST POINT LOCATED AT TOP EDGE OF MODULE
   EX: A-ⓐ = TEST TRIG A MODULE A5



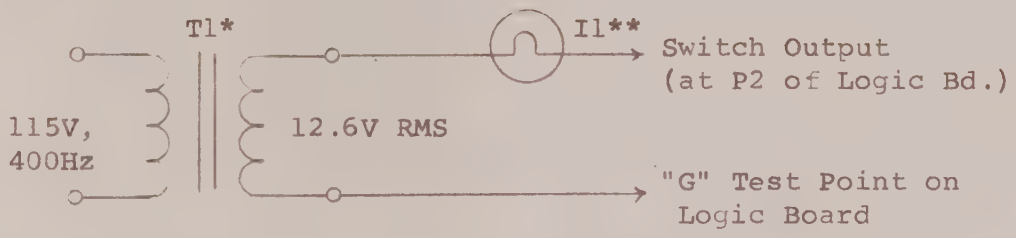


REVISIONS			

C-

SHEET OF REV

ITEM	PART NUMBER	DESCRIPTION
MATERIAL / SPEC		NORTH ATLANTIC industries, inc.
HEAT TREATMENT / SPEC		DRAWN BY
FINISH / SPEC		CHECKED
		PROJ. ENG.
		SCALE / TOLERANCES UNLESS OTHERWISE SPECIFIED / FRACT ±



SWITCH TEST CIRCUIT

FIGURE 5.3

*T1 - Any 12.6V Filament Transformer

**I1 - Lamp, Sylvania #10CSB
Lamp Socket, Sylvania #B0151

5.5 DEGAUSSING

Attach the circuit to be degaussed as shown in Figure 5.4. The 60Hz voltage being applied to the instrument should be brought up slowly from zero until the point at which saturation occurs. This will be evidenced when further increasing the setting of the Variac results in a relatively small increase in the voltage applied across the instrument. Allow the instrument to remain under saturated conditions for a period of about 15 minutes. Then, very slowly, over a period of about 10 minutes, reduce the voltage to the instrument to zero. Any residual magnetism which had been stored in the core by the D.C. should now be removed and the instrument should function properly. If the instrument still does not function with the specified tolerances, it should be returned to the factory.

5.5.1 Input Degaussing: The converter should be connected to power source, turned on, and reference removed. The converter can now be degaussed by connecting circuit on Figure 5.4 to 115V input terminal and the return.

5.5.2 Output Degaussing: If the output transformers are the ones that require degaussing, connect the circuit of Figure 5.4 between S1 and S3, and then between S2 and S4. Converter should be in the RSVR mode. In the case of a synchro only unit, degauss between S1 and S3, then between S2 and S3.

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200 terminal drive, plainview, n. y. OVerbrook 1-8600

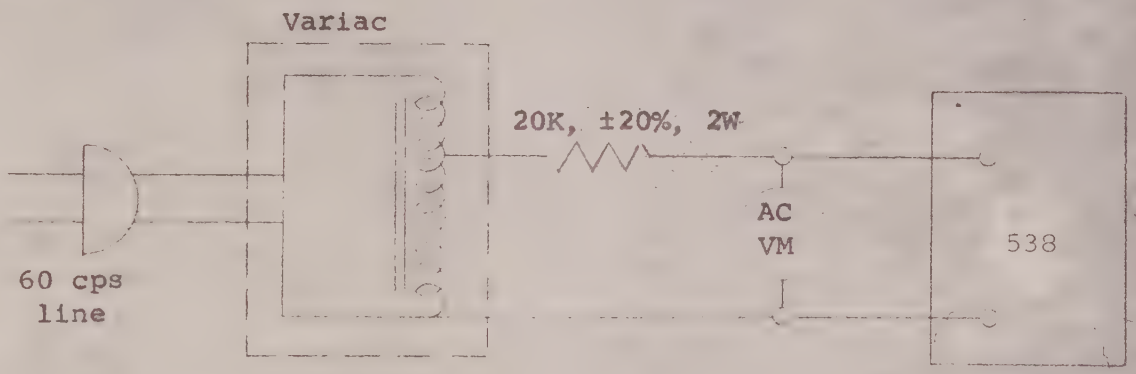

FIGURE 5.2

DEGAUSSING CIRCUIT

5.6 SPECIAL TOOLS

Printed circuit extender cards are available from North Atlantic Industries to facilitate testing and troubleshooting. Part number and description are listed below:

EXTENDER PART NO.	DESCRIPTION
782697-1	12-Pins Double Sided
782697-2	20-Pins Double Sided
782697-3	30-Pins Double Sided
782697-4	44-Pins Double Sided

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200 terminal drive, plainview, n. y. OVerbrook 1-8600

ANGLE *	INPUT DATA BITS D2-1	D2-2	D2-3	D2-4	D2-5	** STO-2-5 CTO-	SEO-2-5 CRO	STI-2-5 CT1-	SEI-2-5 CR1-	ST2-2-5 CT2-	SE2-2-1 CT2-	ST3-
0°	0	0	0	0	0	X	X					
11.25°	0	0	0	0	1			X	X			
22.5°	0	0	0	1	0					X	X	
33.75°	0	0	0	1	1							
45.°	0	0	1	0	0							
56.25°	0	0	1	0	1							
67.5°	0	0	1	1	0							
78.75°	0	0	1	1	1							
90.°	0	1	0	0	0							
101.25°	0	1	0	0	1							
112.5°	0	1	0	1	0							
123.75°	0	1	0	1	1							
135°	0	1	1	0	0							
146.25°	0	1	1	0	1						X	
157.5°	0	1	1	1	0				X	X		
168.75°	0	1	1	1	1		X	X				
180.°	1	0	0	0	0	X	X					
191.25°	1	0	0	0	1			X	X			
202.5°	1	0	0	1	0					X	X	
213.75°	1	0	0	1	1							
225.°	1	0	1	0	0							
236.25°	1	0	1	0	1							
247.5°	1	0	1	1	0							
258.75°	1	0	1	1	1							
270.°	1	1	0	0	0							
281.25°	1	1	0	0	1							
292.5°	1	1	0	1	0							
303.75°	1	1	0	1	1							
315°	1	1	1	0	0							
326.25°	1	1	1	0	1						X	
337.5°	1	1	1	1	0					X		
348.75°	1	1	1	1	1		X	X				
0° or 360°	0	0	0	0	0	X	X					

NOTES: * THE ANGLE AND TRANSFORMER SWITCH PROGRAMMED ARE DEPENDENT ON THE STATES OF THE INTERPOLATION BITS (2-6, -7, etc.).

** S = SINE T = TRIG
C = COSINE R = REFERENCE

FORM NO. 1127

GIC AND SWITCHING CHART

TRANSFORMER SWITCHES (X = TURNED ON)

ST4- 2-5 CR4-	ST5- 2-5 CT5-	ST2- 2-5 CR5-	ST6- 2-5 CT6-	ST5- 2-5 CR6-	ST7- 2-5 CT7-	ST7- 2-5 CT7-	ST8- 2-5 CT8-	S+	S-	C+	C-	S^{2}_{1}+	S^{1}_{2}-
								X		X		X	
								X		X		X	
								X		X		X	
								X		X		X	
X	X							X		X		X	
		X	X					X		X		X	
				X	X			X		X		X	
						X	X	X		X		X	
											X		X
											X		X
											X		X
	X	X									X		X
X											X		X
											X		X
											X		X
											X		X
											X		X
											X		X
											X		X
											X		X
									X		X		X
									X		X		X
X	X								X		X		X
		X	X						X		X		X
				X	X				X		X		X
						X	X		X		X		X
									X	X			X
									X	X			X
			X	X					X	X			X
	X	X							X	X			X
X									X	X			X
									X	X			X
									X	X			X
									X	X			X
								X		X		X	

THE FIRST 5 BITS, AS SHOWN, REGARDLESS

P-100989

SECTION VI

PARTS LIST

REPLACEMENT PARTS LIST

DIGITAL TO RSVR/SYN CONV. MOD 538

DESIGNATION	DESCRIPTION	NAI PART NO.	TOTAL QTY.
	DIGITAL TO RSVR/SYN CONV.	783359	
A1	TRANSFORMER ASSEMBLY	782656	1
A2	DISTRIBUTION BOARD	782680	1
A3	TRIG A-1 ASSEMBLY	782654	1
A4	TRIG B-1 ASSEMBLY	782675-1	1
A5	TRIG C-4 ASSEMBLY	782652	1
A6	INTERPOLATION A ASSEMBLY	782651	1
A7	INTERPOLATION B-4 ASSEMBLY	782670	1
A8	INTERPOLATION B-1 ASSEMBLY	782674	1
A10	POWER SUPPLY 45-420Hz	782955	1
A11	MODE PROG. 2 ASSEMBLY	783272	1
F1, F3	Fuse, 8AG, 1A	803049	2
F2	Fuse, 8AG, 3A	803045	1
F4, F5	Fuse, 8AG, 1/2A	803300	2
I1. I3	Cartridge, Lamp, Neon White	804524	2
J1	Connector, MS3102A-24-28P	803498	1
J2	Connector, MS3102A-20-7S	803501	1
J3	Connector, MS3102A-20-7P	803504	1
J4	Connector, MS3102A-20-7PW	804517	1

[illegible] North Atlantic Industries, Inc. reserves the right to make changes, improvements, upgrading components and improving circuits, but reserves the right to substitute components which are functionally interchangeable for any of the parts shown above.

NORTH ATLANTIC industries, inc.
[illegible] Veterans drive, plainview, n. y. (Voice) [illegible]

REPLACEMENT PARTS LIST

DIGITAL TO RSVR/SYN CONV. MOD 538
(cont'd)

DESIGNATION	DESCRIPTION	NAI PART NO.	TOTAL QTY.
J10	Connector, P.C., 44 Pin	804515	1
J11	Connector, P.C., 12 Pin	804516	1
J12	Connector, P.C., 20 Pin	804501	1
R1, R2	Resistor, Fixed, Comp.	801986	2
S1	Switch Slide, 3P3T	804703	1
S2	Switch Slide, DPDT	804520	1
S3	Switch Slide, SPST	804522	1
S4	Switch Slide, 4PDT	805748	1
S5	Switch Slide DP3T	804521	1
XF1 thru XF5	Fuseholder, 8AG	803485	5
XI1, XI2	Lampholder	801304	2
	Post, Binding, Red	800119	6
	Post, Binding, Black	800120	1
	Post, Binding	800546	1

Consistent with North Atlantic Industries' policy of continuously up-grading components and improving circuits, we reserve the right to substitute components which are functionally interchangeable for any of the parts shown above.

REPLACEMENT PARTS LIST

A1 - TRANSFORMER ASSY.

782656

DESIGNATION	DESCRIPTION	NAI PART NO.	TOTAL QTY
C1 thru C6	Capacitor, Fixed, Elec. Alum. 200 μfd, 15V, -10 +75%	803060	6
C7 thru C12	Capacitor, Fixed, Elec. Alum. 500 μfd, 3V, -10 +75%	801206	6
J1 thru J6	Connector, P.C., 20 Pin	804501	6
J7	Connector, P.C., 12 Pin	804516	1
J8	Connector, P.C., 30 Pin	804514	1

Consistent with North Atlantic Industries' policy of continuously up-grading components and improving circuits, we reserve the right to substitute components which are functionally interchangeable for any of the parts shown above.

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REPLACEMENT PARTS LIST

A2 - DISTRIBUTION BOARD ASSEMBLY

782680

DESIGNATION	DESCRIPTION	NAI PART NO.	TOTAL QTY
J1 thru J6	Connector, P.C., 44 Pin	804372	6
J7	Connector, P.C., 20 Pin	804500	1

Consistent with North Atlantic Industries' policy of continuously up-grading components and improving circuits, we reserve the right to substitute components which are functionally interchangeable for any of the parts shown above.

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REPLACEMENT PARTS LIST

A3 - TRIG A-1 ASSEMBLY
782654-1

DESIGNATION	DESCRIPTION	NAI PART NO.	TOTAL QTY
C1, C2, C3	Capacitor, Fixed, Film .056 μf, 80V, ± 10%	803259	3
L1	Choke, 33 μh	803823	1
Z1	Integrated Circuit, MC836P	804344	1
Z2, Z5, Z6	Integrated Circuit, MC846P	803797	3
Z3, Z4	Integrated Circuit, MC830P	803801	2
Z7, Z8, Z9, Z10	Transformer Switch A-1	C-782663	4
Z11, Z13, Z15	Transformer Switch - B	C-782668	3
Z12, Z14	Transformer Switch - A3	C-782665	2

Consistent with North Atlantic Industries' policy of continuously up-grading components and improving circuits, we reserve the right to substitute components which are functionally interchangeable for any of the parts shown above.

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REPLACEMENT PARTS LIST

A4 - TRIG B-1 ASSEMBLY

782675-1

DESIGNATION	DESCRIPTION	NAI PART NO.	TOTAL QTY
C1, C2, C3	Capacitor, Fixed, Film .056 μf, 80V, ± 10%	803259	3
L1	Choke, 33 μh	803823	1
Z1	Integrated Circuit	804344	1
Z2, Z6, Z7	Integrated Circuit	803797	3
Z3, Z4, Z5	Integrated Circuit	803801	3
Z8, Z9	Switch Transformer A-2	C-782664	2
Z10, Z12, Z14	Switch Transformer A-3	C-782665	3
Z11, Z13, Z15	Switch Transformer B	C-782668	3

Consistent with North Atlantic Industries' policy of continuously up-grading components and improving circuits, we reserve the right to substitute components which are functionally interchangeable for any of the parts shown above.

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REPLACEMENT PARTS LIST

A5 - TRIG C-4 ASSEMBLY
782652

DESIGNATION	DESCRIPTION	NAI PART NO.	TOTAL QTY.
C1, C2, C3	Capacitor, Fixed, Film .056 μf, 80V, ± 10%	803259	3
C4	Capacitor, Fixed, Film .0033 μfd, 80V, ± 20%	803865	1
C4A	Capacitor, Select at Test		
C5	Capacitor, Fixed, Mica 300 pf, 500V, ± 5%	803249	1
C5A	Capacitor, Trim, Select at Test		
C6	Capacitor, Fixed, Mica 500 pf, 500V, ± 10%	801816	1
CR1	Diode, 1N3069	802924	1
L1	Choke, 33 μh	803823	1
Q1	Transistor, MPS6531	804294	1
R1	Resistor, Fixed, Comp. 180 Ω, 1/4W, ± 5%	802462	1
R2	Resistor, Trim, Select at Test		
R3	Resistor, Fixed, Comp. 51 Ω, 1/4W, ± 5%	801980	1
R4	Resistor, Fixed, Comp. 3.9K, 1/4W, ± 5%	801409	1
R5	Resistor, Fixed, Comp. 5.6K, 1/4W, ± 5%	801983	1
R6, R9	Resistor, Fixed, Comp. 2K, 1/4W, ± 5%	801094	2
R7	Resistor, Fixed, Comp. 1.8K, 1/4W, ± 5%	804004	1

Consistent with North Atlantic Industries' policy of continuously up-grading components and improving circuits, we reserve the right to substitute components which are functionally interchangeable for any of the parts shown above.

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REPLACEMENT PARTS LIST

A5 - TRIG C-4 ASSEMBLY 782652
(CON'T)

DESIGNATION	DESCRIPTION	NAI PART NO.	TOTAL QTY
R8	Resistor, Fixed, Comp. 18K, 1/4W, ± 5%	802183	1
Z1, Z2, Z3, Z8	Integrated Circuit, MC846P	803797	4
Z4, Z5, Z6	Integrated Circuit, MC830P	803801	3
Z7	Integrated Circuit, MC851P	804489	1
Z9	Integrated Circuit, MC849P	804458	1
Z10, Z12, Z14	Transformer Switch A3	C-782665	3
Z11, Z13, Z15	Transformer Switch B	B-782668	3

Consistent with North Atlantic Industries' policy of continuously up-grading components and improving circuits, we reserve the right to substitute components which are functionally interchangeable for any of the parts shown above.

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200 terminal drive, plainview, n. y. OVerbrook 1-8600

S1364

REPLACEMENT PARTS LIST

A6 - INTERPOLATION A ASSEMBLY
782651

DESIGNATION	DESCRIPTION	NAI PART NO.	TOTAL QTY.
C1, C2, C3	Capacitor, Fixed, Film .056 μf, 80V, ± 10%	803259	3
L1	Choke, 33 μh	803823	1
Z1, Z3	Integrated Circuit, MC846P	803797	2
Z2, Z4	Integrated Circuit, MC836P	804344	2
Z5, Z6, Z7, Z8	Transformer Switch A-3	C-782665	4
Z9, Z10, Z11, Z12	Transformer Switch A-4	C-782666	4

Consistent with North Atlantic Industries' policy of continuously up-grading components and improving circuits, we reserve the right to substitute components which are functionally interchangeable for any of the parts shown above.

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200 terminal drive, plainview, n. y. OVerbrook 1-8600

REPLACEMENT PARTS LIST

A7 - INTERPOLATION B-4 ASSEMBLY 782670

DESIGNATION	DESCRIPTION	NAI PART NO.	TOTAL QTY.
C1, C2, C3	Capacitor, Fixed, Film .056 μf, 80V, ± 10%	803259	3
L1	Choke, 33 μh	803823	1
Z1, Z3	Integrated Circuit, MC846P	803797	2
Z2, Z4	Integrated Circuit, MC836P	804344	2
Z5 thru Z12	Transformer Switch A-4	C-782666	8

Consistent with North Atlantic Industries' policy of continuously up-grading components and improving circuits, we reserve the right to substitute components which are functionally interchangeable for any of the parts shown above.

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200 terminal drive, plainview, n. y. OVerbrook 1-8600

REPLACEMENT PARTS LIST

DESIGNATION	DESCRIPTION	NAI PART NO.	TOTAL QTY.
A8	INTERPOLATION B1 ASSEMBLY	782674	1
A8C1, C2, C3	Capacitor, Fixed, Film	803259	3
A8L1	Choke, 33 μh	803823	1
A8Z1	Integrated Circuit, MC846P	803797	1
A8Z2	Integrated Circuit, MC836P	804344	1
A8Z5, Z7	Transformer Switch A4	782666	2

Consistent with North Atlantic Industries' policy of continuously up-grading components and improving circuits, we reserve the right to substitute components which are functionally interchangeable for any of the parts shown above.

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200 terminal drive, plainview, n. y. OVerbrook 1-8600

REPLACEMENT PARTS LIST

DIGITAL TO RSVR/SYN CONV. MOD 538-

DESIGNATION	DESCRIPTION	NAI PART NO.	TOTAL QTY.
A10	POWER SUPPLY ASSEMBLY (45-420 Hz)	782955	1
A10C3	Capacitor, Fixed, Elec. Alum. 5500 µf, 40V, +75, -10%	804334	1
A10C4A, C4B, A10C4C	Capacitor, Fixed, Elec. Alum. 13000 µf, 15V, +75 -10%	804185	3
A10C5	Capacitor, Fixed, Elec. Alum. 5500 µf, 25V, +75 -10%	804184	1
A10C6, C7, C8	Capacitor, Fixed, Elec. Alum. 350 µf, 25V, +75 -10%	804720	3
T1	Transformer	203503	1
	Power Supply Card Assembly	782956	1
C1,C2	Capacitor, Fixed, Film .01 µfd, 80V, ± 20%	803184	2
CR1, CR2	Diac, 1N5411	805064	2
CR3, CR4	Triac, RCA 40529	805063	2
CR6, CR6	Diode, Zener, 1N4743A	803329	2
CR7, CR8	Diode, 1N4001	804477	2
CR9, CR5	Diode, Zener 1N4736A	804416	1
Q1, Q2, Q3	Transistor, 2N3739	804809	3
Q4	Transistor	803529-2	1
Q5	Transistor	804480	1
Q6, Q7, Q8	Transistor, RCA 40514	804479	3
R1	Resistor, Fixed, Comp. 3.9 KΩ, 1/4W, ± 5%	801409	1

Consistent with North Atlantic Industries' policy of continuously up-grading components and improving circuits, we reserve the right to substitute components which are functionally interchangeable for any of the parts shown above.

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200 terminal drive, plainview, n. y. OVerbrook 1-8600

REPLACEMENT PARTS LIST

DIGITAL TO RSVR/SYN CONV. MOD 538-

DESIGNATION	DESCRIPTION	NAI PART NO.	TOTAL QTY.
A10	POWER SUPPLY ASSEMBY	782955	
	POWER SUPPLY CARD ASSEMBLY	782956	
R2	Resistor, Fixed, Comp. 10 KΩ, 1/4W, ± 5%	801006	1
R3	Resistor, Fixed, Comp. 82 KΩ, 1/2W, ± 5%	801259	1
R4	Resistor, Fixed, Comp. 7.5 KΩ, 1/4W, ± 5%	801984	1
R5, R10	Resistor, Fixed, Comp. 100 Ω, 1/2W, ± 5%	800631	2
R6	Resistor, Fixed, Comp. 51 Ω, 1/4W, ± 5%	801980	1
R7	Resistor, Fixed, Comp. 120 Ω, 1/2W, ± 5%	800407	1
R8, R11	Resistor, Fixed, Comp. 2 KΩ, 1/4W, ± 5%	801094	2
R9	Resistor, Fixed, Comp. 33 Ω, 1/2W, ± 5%	800413	1
R12	Resistor, Fixed, Comp. 6.8 Ω, 1/2W, ± 5%	802745	1
R13	Reistor, Fixed, Comp. 2.2 KΩ, 1/4W, ± 5%	802230	1
R14	Potentiometer, 2KΩ	804954	I
R15	Potentiometer, 5 KΩ	804978	1
Z1, Z3	Diode, Bridge	804332	2

Consistent with North Atlantic Industries' policy of continuously up-grading components and improving circuits, we reserve the right to substitute components which are functionally interchangeable for any of the parts shown above.

NORTH ATLANTIC industries, inc.
300 terminal drive, plainview, n. y. OVerbrook 1 8600

REPLACEMENT PARTS LIST

DIGITAL TO RSVR/SYN CONV. MOD 538-1

DESIGNATION	DESCRIPTION	NAI PART NO.	TOTAL QTY.
A10	POWER SUPPLY ASSEMBLY	782955	
	POWER SUPPLY CARD ASSEMBLY	782956	
Z2	Diode, Bridge	804491	1
Z4, Z6	Assembly, Limiter	782809	2
Z5	Assembly, Limiter	782810	1
	Transipad	802335	

3 of 3

Rev A - 5/12/72

Consistent with North Atlantic Industries' policy of continuously up-grading components and improving circuits, we reserve the right to substitute components which are functionally interchangeable for any of the parts shown above.

NORTH ATLANTIC industries, inc.
200 terminal drive, plainview, n. y. OVerbrook 1-8600

REPLACEMENT PARTS LIST

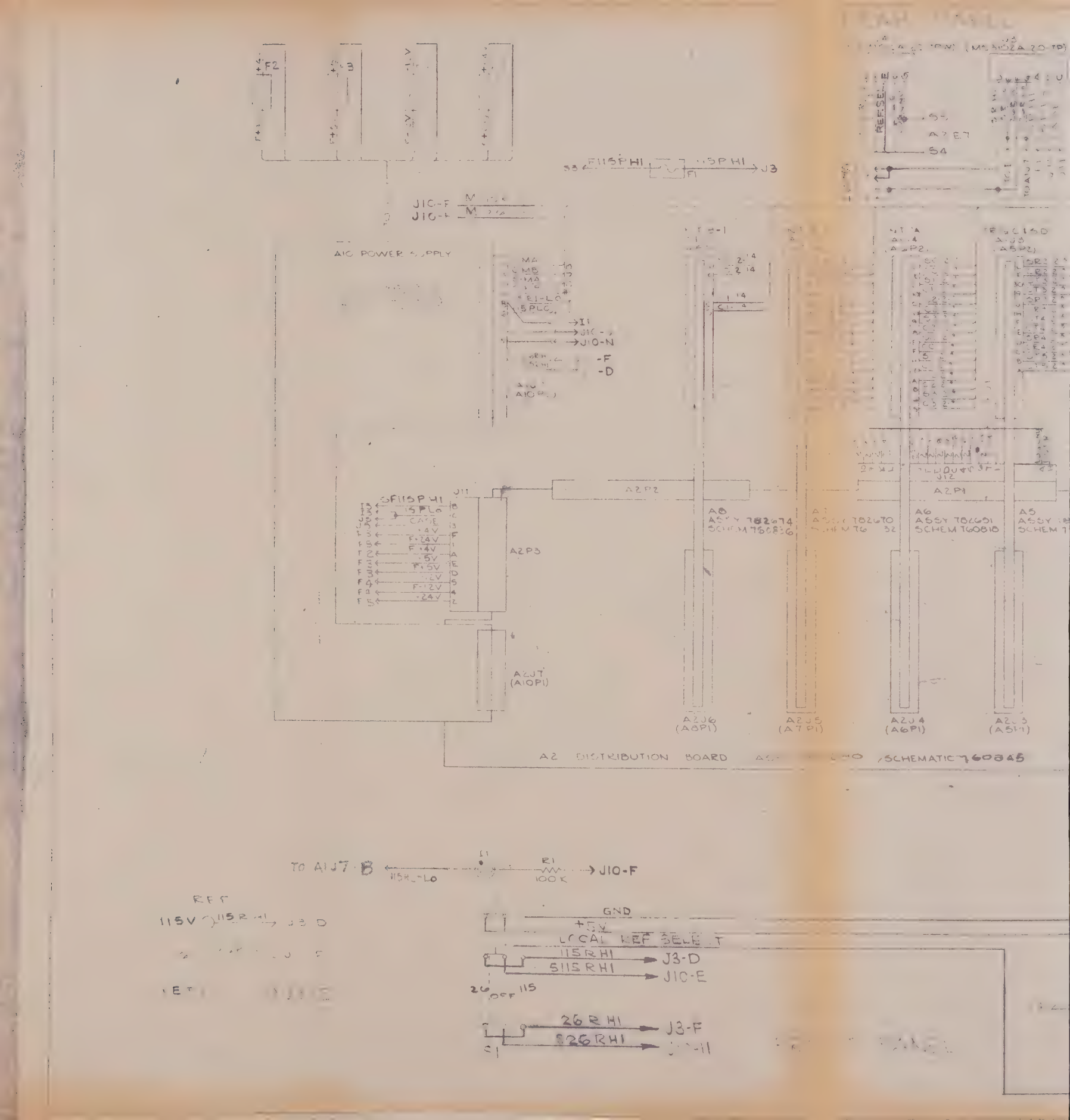
DESIGNATION	DESCRIPTION	NAI PART NO.	TOTAL QTY.
	All-MODE PROGRAM ASSEMBLY	783272	
CR2, 3, 4, 5	Diode 1N4001	804477	4
K1, K2	Relay (4Poles)	804494	2
K3, 4, 5, 6	Relay (3 Poles)	804495	4
Q1, 3, 4, 5	Transistor MPS6531	804294	4
R1, 7, 10, 13	Resistor 51K, 1/4W	801985	4
R2, 8, 11, 14	Resistor 2K, 1/4W	801094	4
R3, 9, 12, 15	Resistor 20K, 1/4W	801636	4

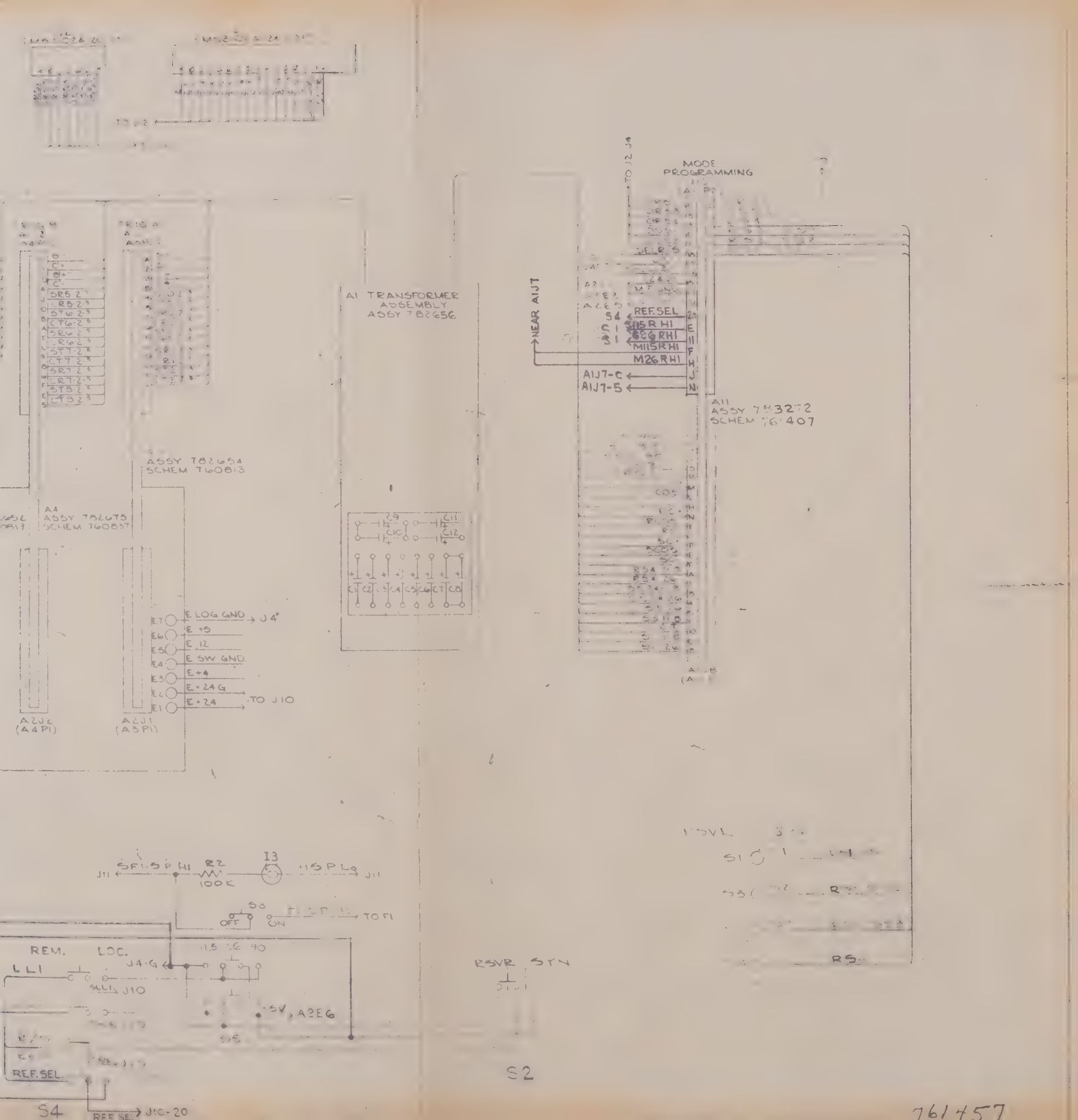
Consistent with North Atlantic Industries' policy of continuously up-grading components and improving circuits, we reserve the right to substitute components which are functionally interchangeable for any of the parts shown above.

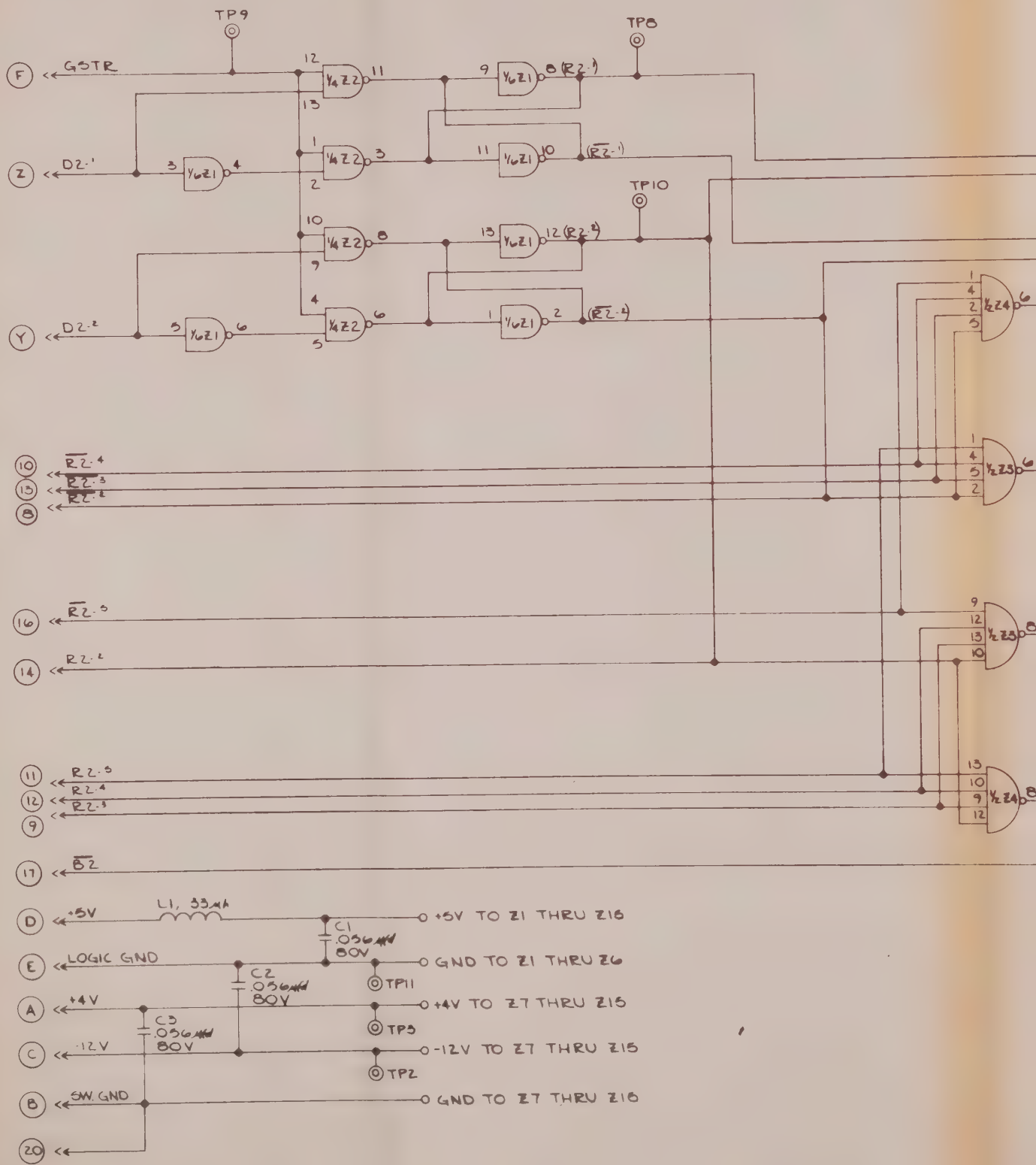
NORTH ATLANTIC *industries, inc.*
200 terminal drive, plainview, n. y. OVerbrook 1-8600

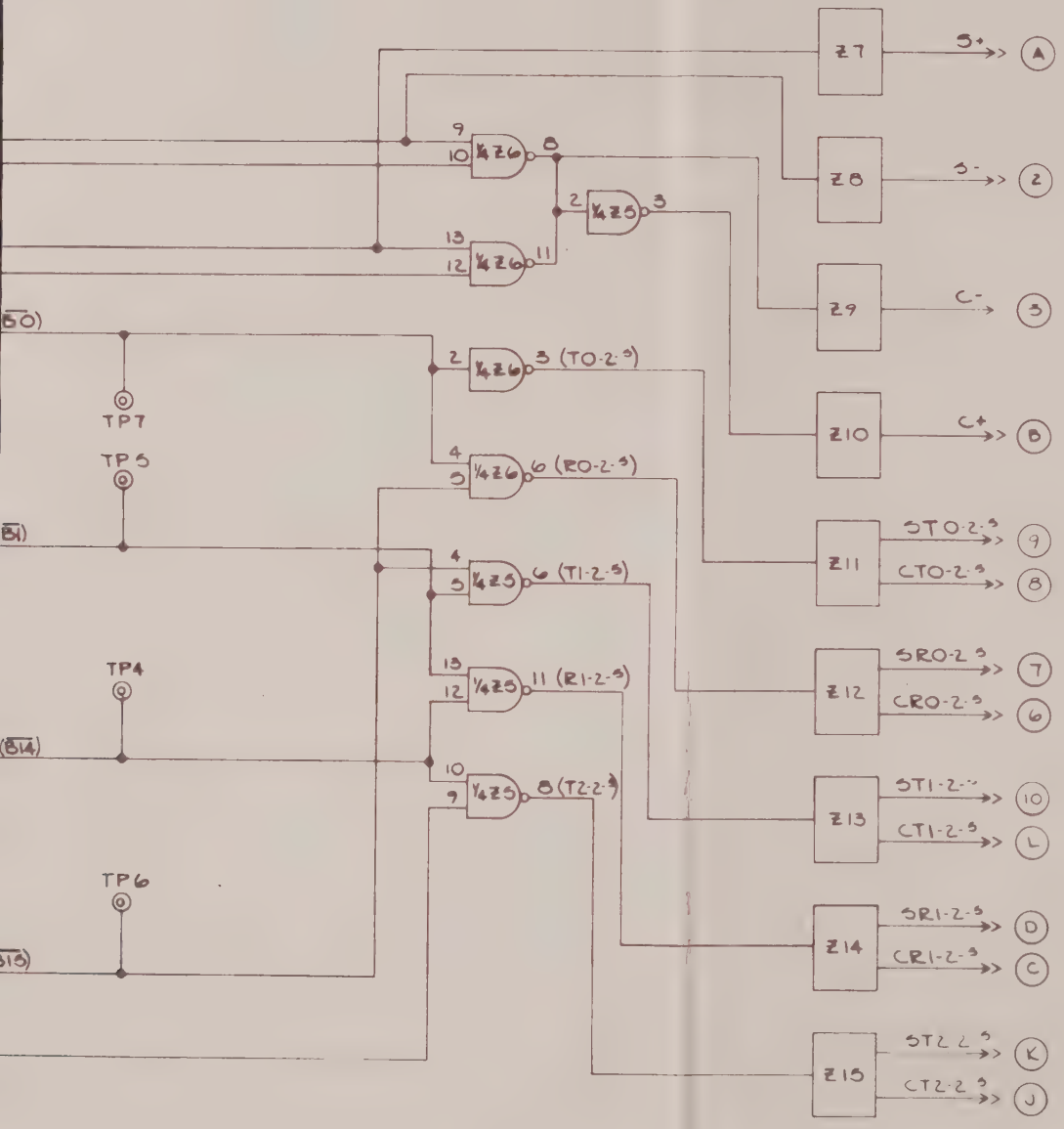
SECTION VII

SCHEMATICS


A1C POWER SUPPLY
A2P2
A2P3
A2J1
(A1OP1)
A2J6
(A8P1)
A2J5
(A7P1)
A2J4
(A6P1)
A2J3
(A5P1)
A2 DISTRIBUTION BOARD
SCHEMATIC 760845
J10-F
J10-E
GND
+5V
LOCAL REF SELECT
115R HI
J3-D
J10-E
26R HI
J3-F


MODE PROGRAMMING
TO J2 J4
NEAR A1J7
A1 TRANSFORMER ASSEMBLY ASSY 782656
ASSY 782654 SCHEM 760813
A4 ASSY 782673 SCHEM 760837
A2J2 (A4P1)
A2J1 (A3P1)
E LOG GND → J4
E +5
E 12
E SW GND
E +4
E +24 G
E +24 → TO J10
REF SEL
M115R HI
M26R HI
A1J7-C
A1J7-5
A11 ASSY 783272 SCHEM 761407
115P HI
R2 100K
I3
115P LO
S8
OFF
ON
TO F1
REM. LOC.
J4-G
S6
+5V → A2E6
REF SEL.
S4
REF SEL → J1C-20
S2
761457

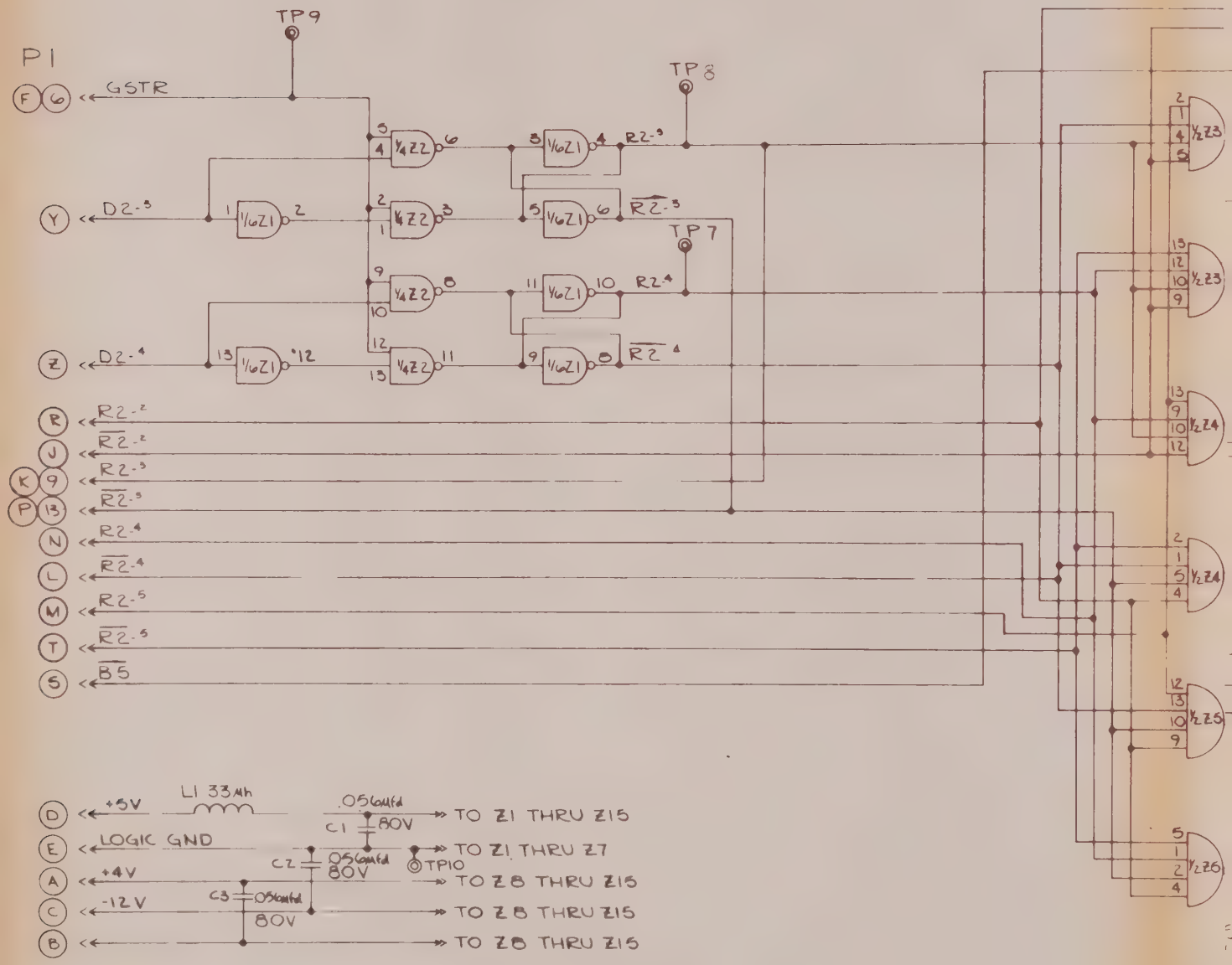

TP9
TP8
TP10
F
GSTR
Z
D2-1
Y
D2-2
(R2-1)
(R2-2)
(R2-4)
10
13
8
16
14
11
12
9
17
D
+5V
L1, 33μH
C1
.056
80V
+5V TO Z1 THRU Z16
E
LOGIC GND
C2
.056
80V
GND TO Z1 THRU Z6
TP11
A
+4V
C3
.056
80V
+4V TO Z7 THRU Z15
TP3
C
-12V
-12V TO Z7 THRU Z15
TP2
B
SW. GND
GND TO Z7 THRU Z16
20
P1



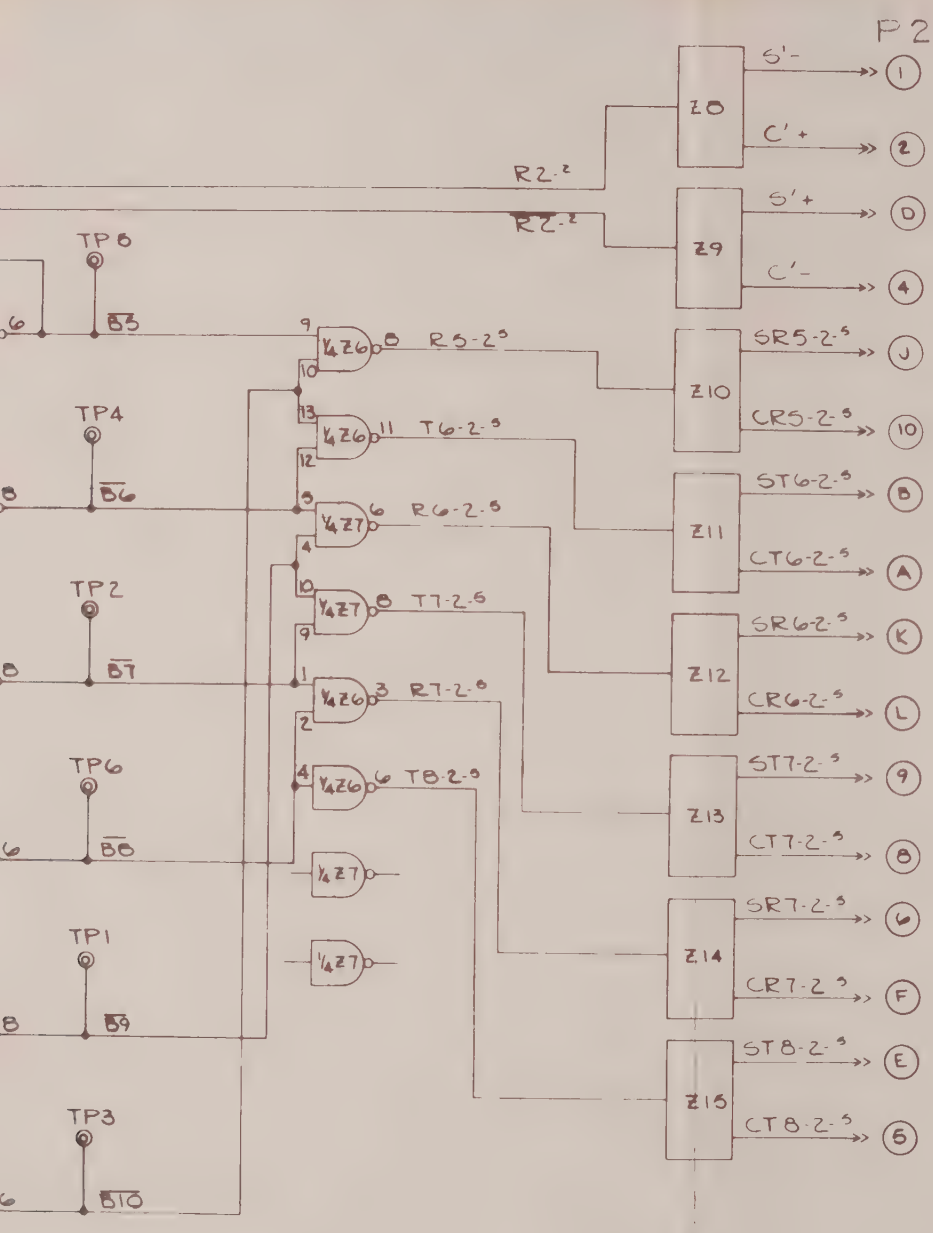
P2

SCHEMATIC
TRIG "A"

100601

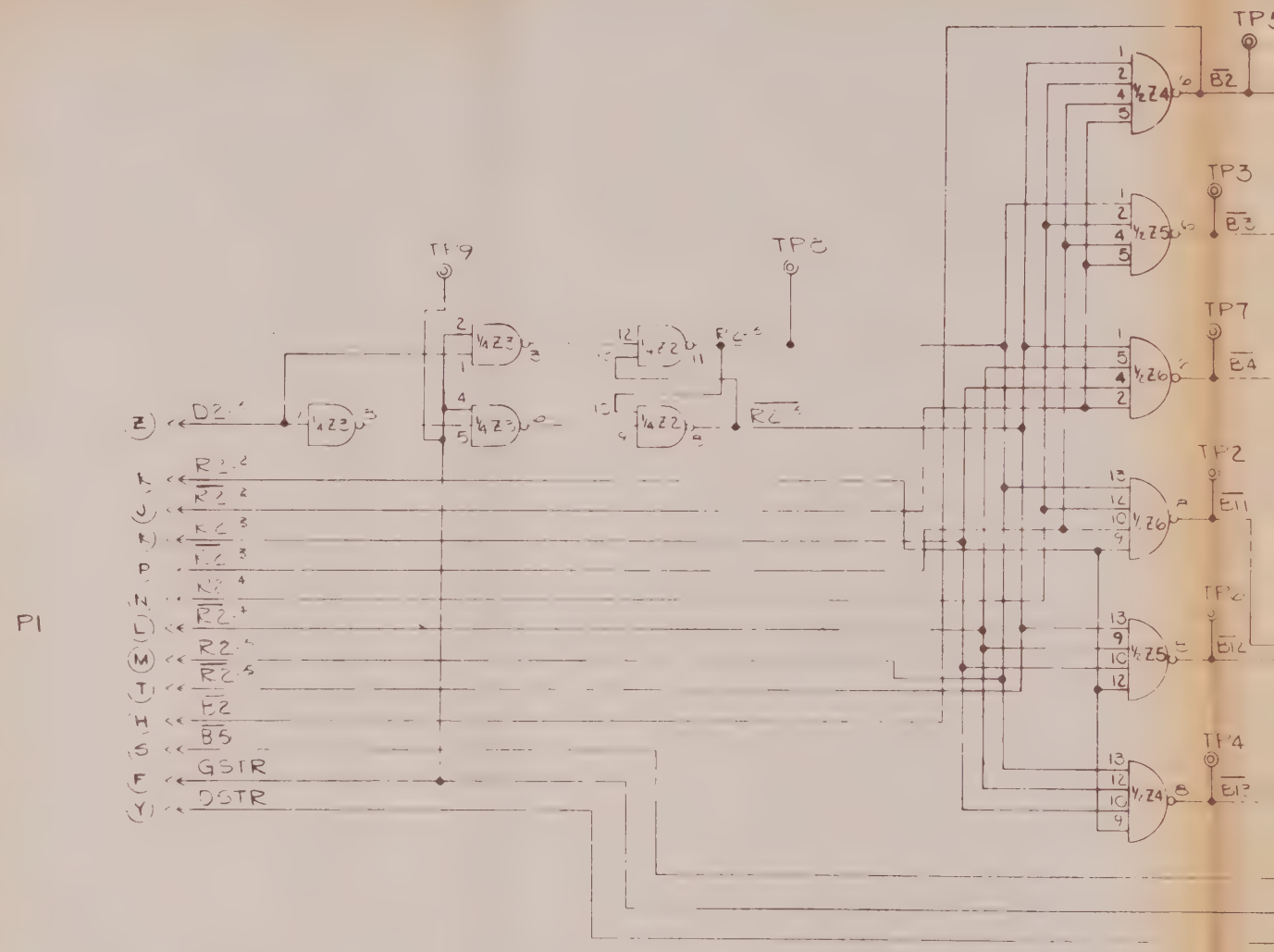

P1
TP9
TP8
TP7
GSTR
D2-3
D2-4
R2-2
R2-3
R2-4
R2-5
B5
1/6Z1
1/4Z2
1/2Z3
1/2Z4
1/2Z5
1/2Z6

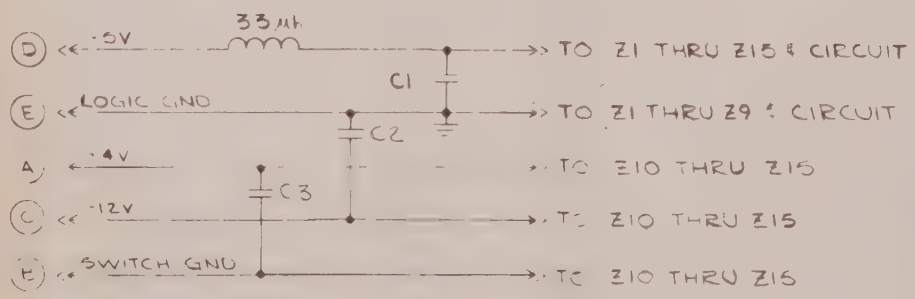
+5V
LOGIC GND
+4V
-12V
L1 33uh
.056ufd
C1
80V
C2
C3
TP10
TO Z1 THRU Z15
TO Z1 THRU Z7
TO Z8 THRU Z15
TO Z8 THRU Z15
TO Z8 THRU Z15



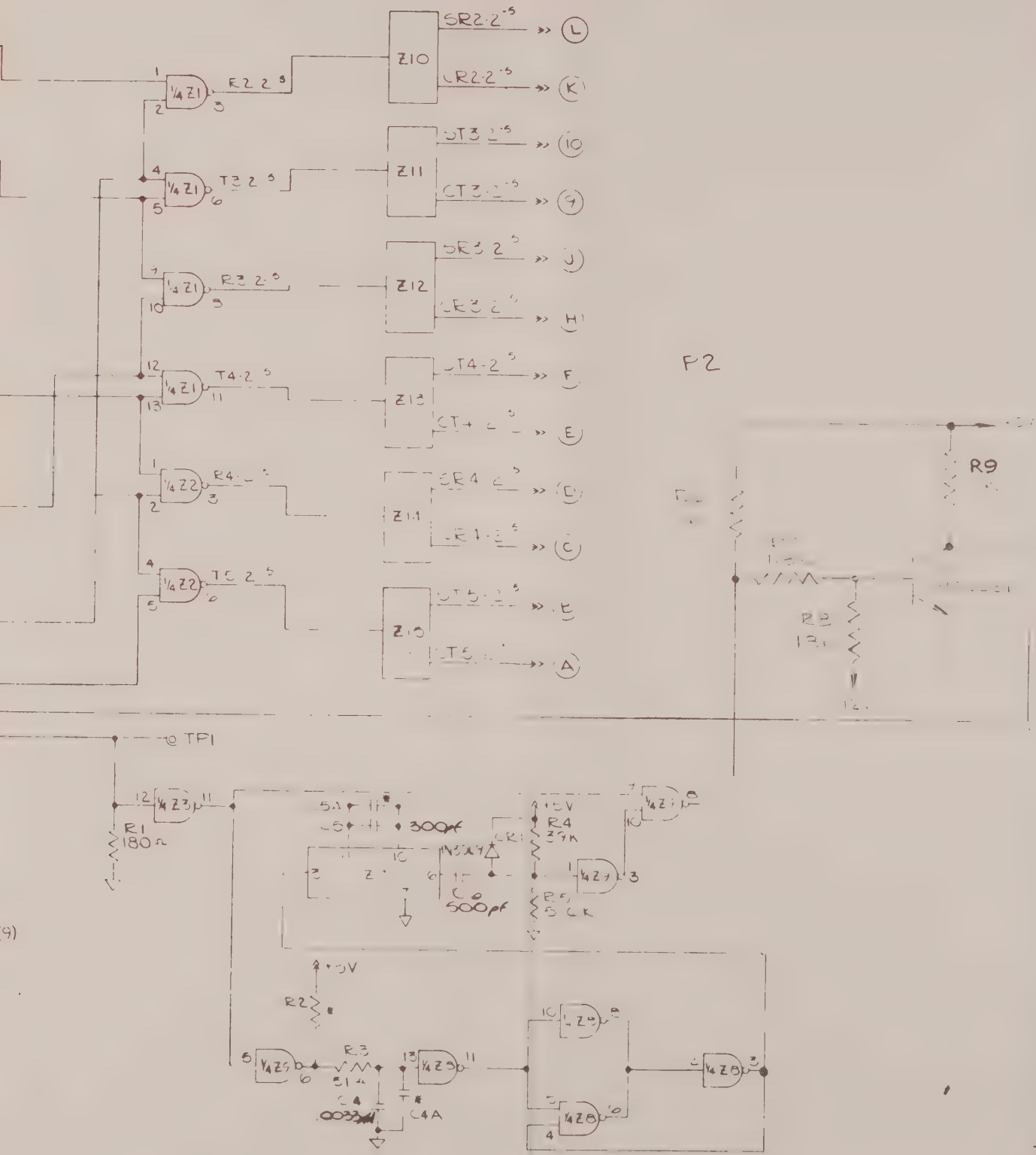
SCHEMATIC
TRIG "B"

100602



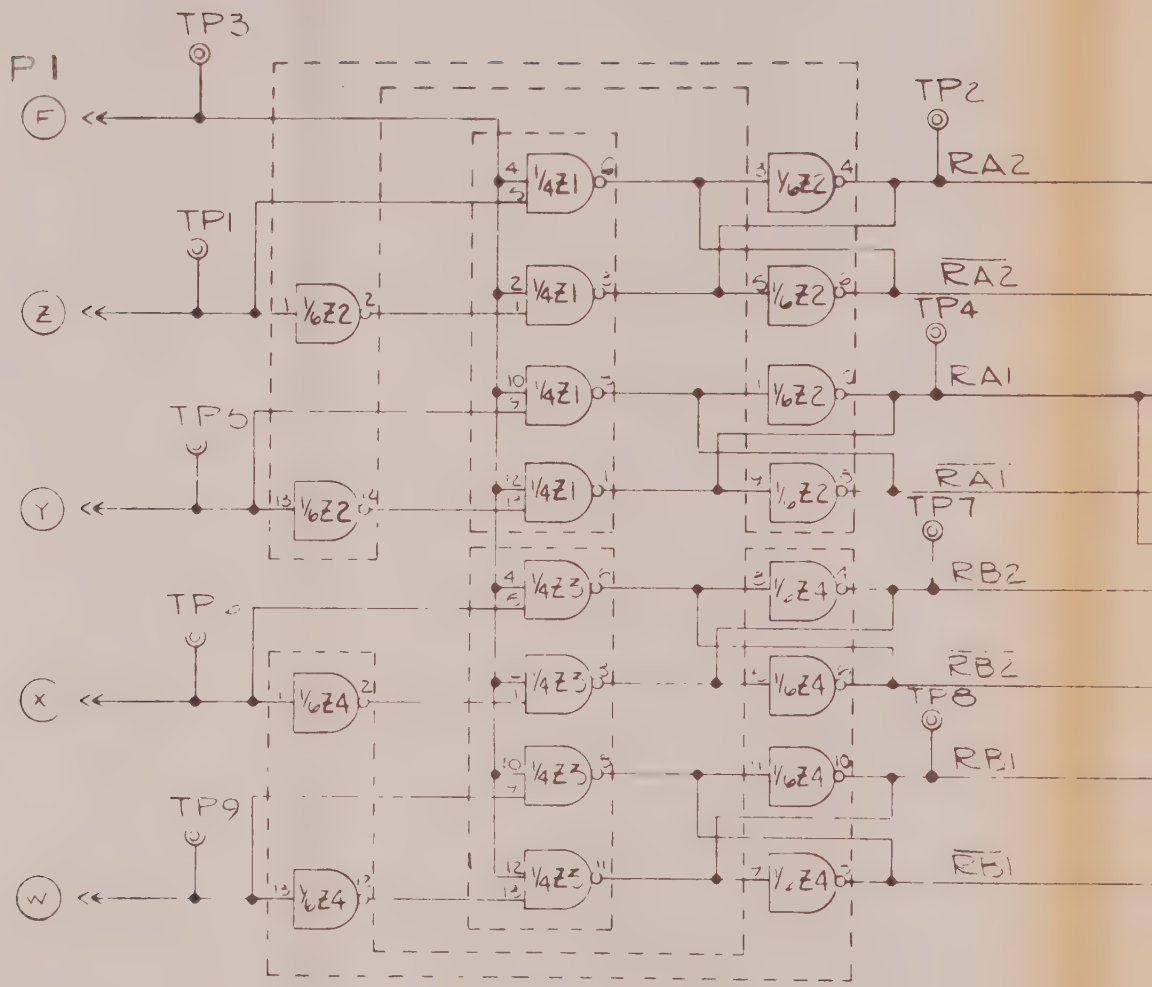


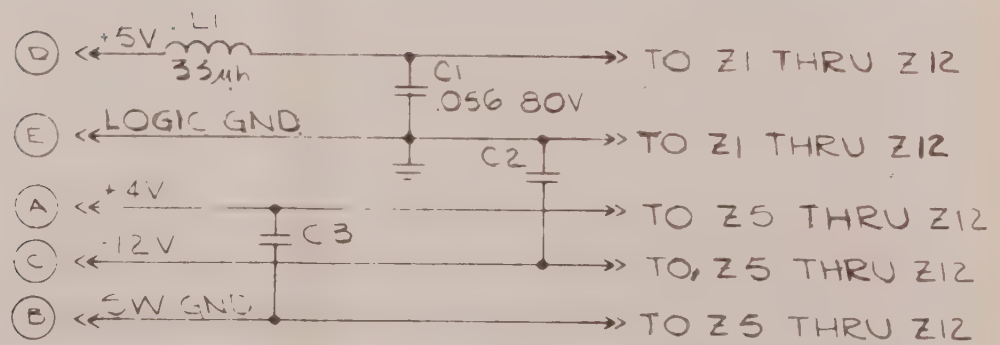
NOTES
1. T.P. IDENTIFIES TEST POINTS
2. C1, C2 AND C3 .056MFD @ 50V
3. ALL RESISTORS 1/4 W 5%
4. * DENOTES TRIMS, SELECT AT TEST

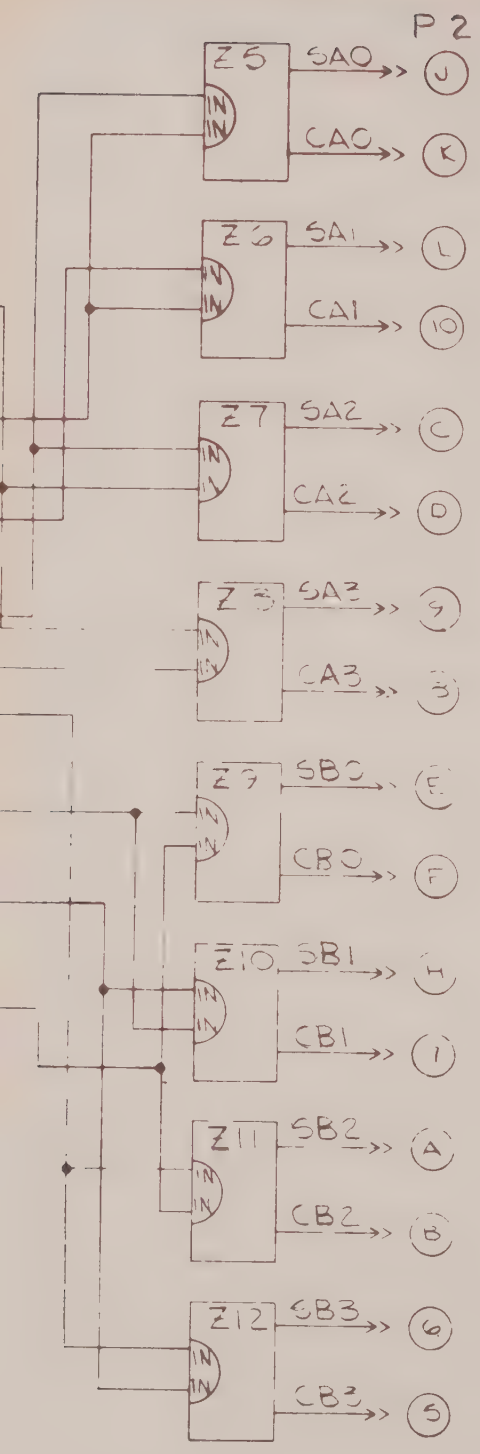


SCHEMATIC
TRIG "C-4"

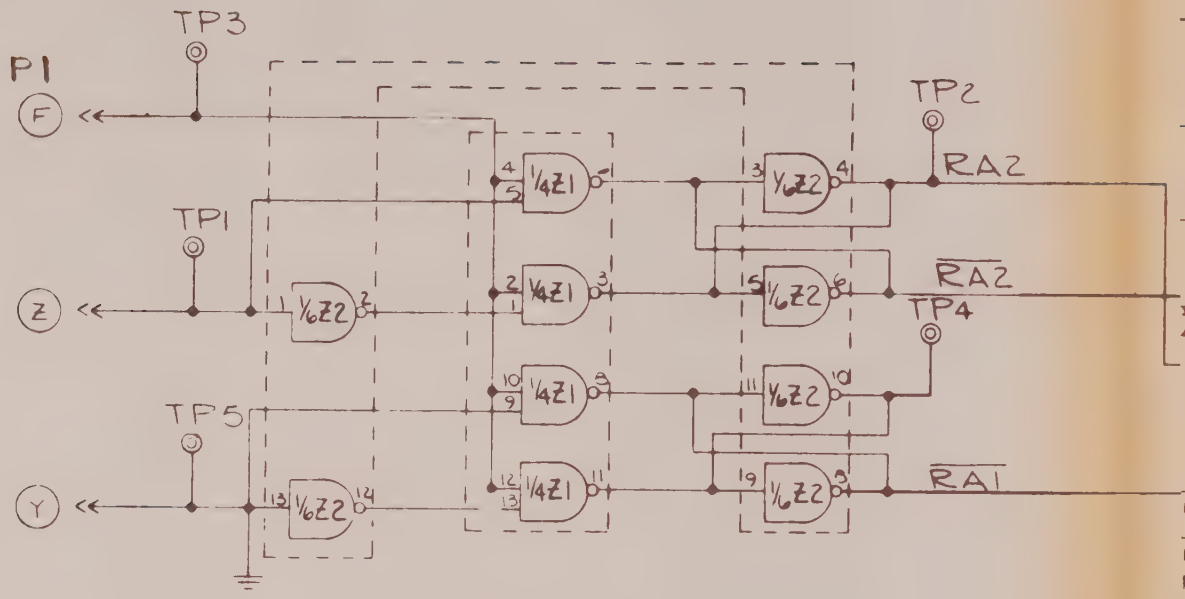
100647

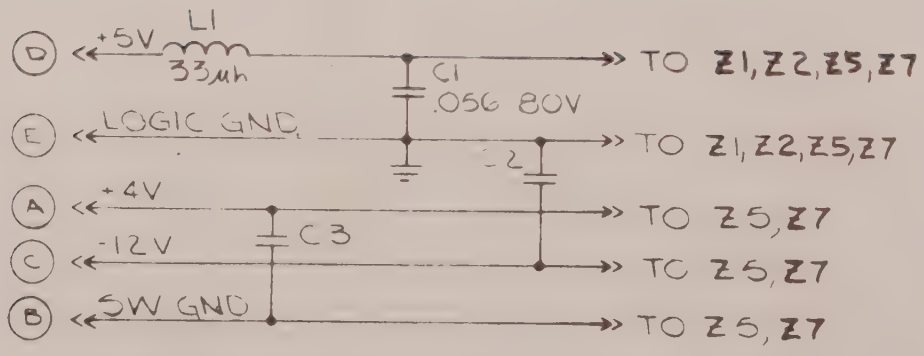

P1
TP3
TP1
TP5
TP
TP9
TP2
TP4
TP7
TP8
RA2
$\overline{RA2}$
RA1
$\overline{RA1}$
RB2
$\overline{RB2}$
RB1
$\overline{RB1}$
1/4Z1
1/4Z3
1/6Z2
1/6Z4

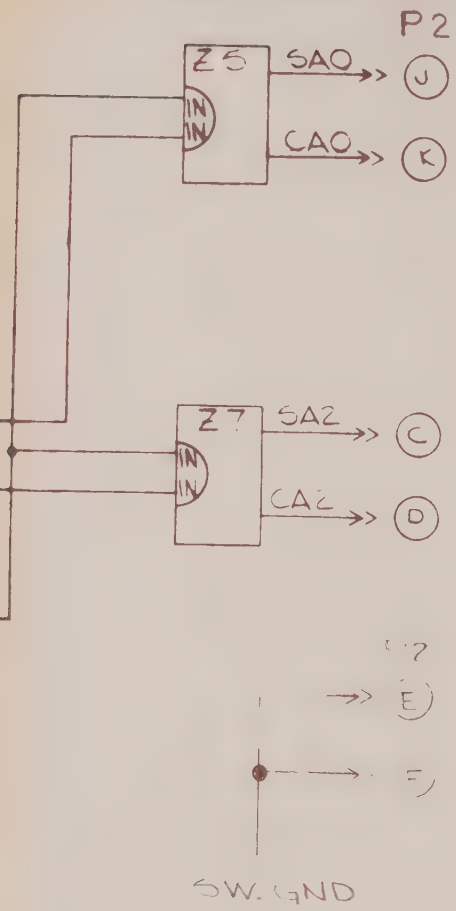

+5V
L1
33μh
C1
.056 80V
LOGIC GND
C2
+4V
C3
-12V
-5W GND
TO Z1 THRU Z12
TO Z1 THRU Z12
TO Z5 THRU Z12
TO Z5 THRU Z12
TO Z5 THRU Z12



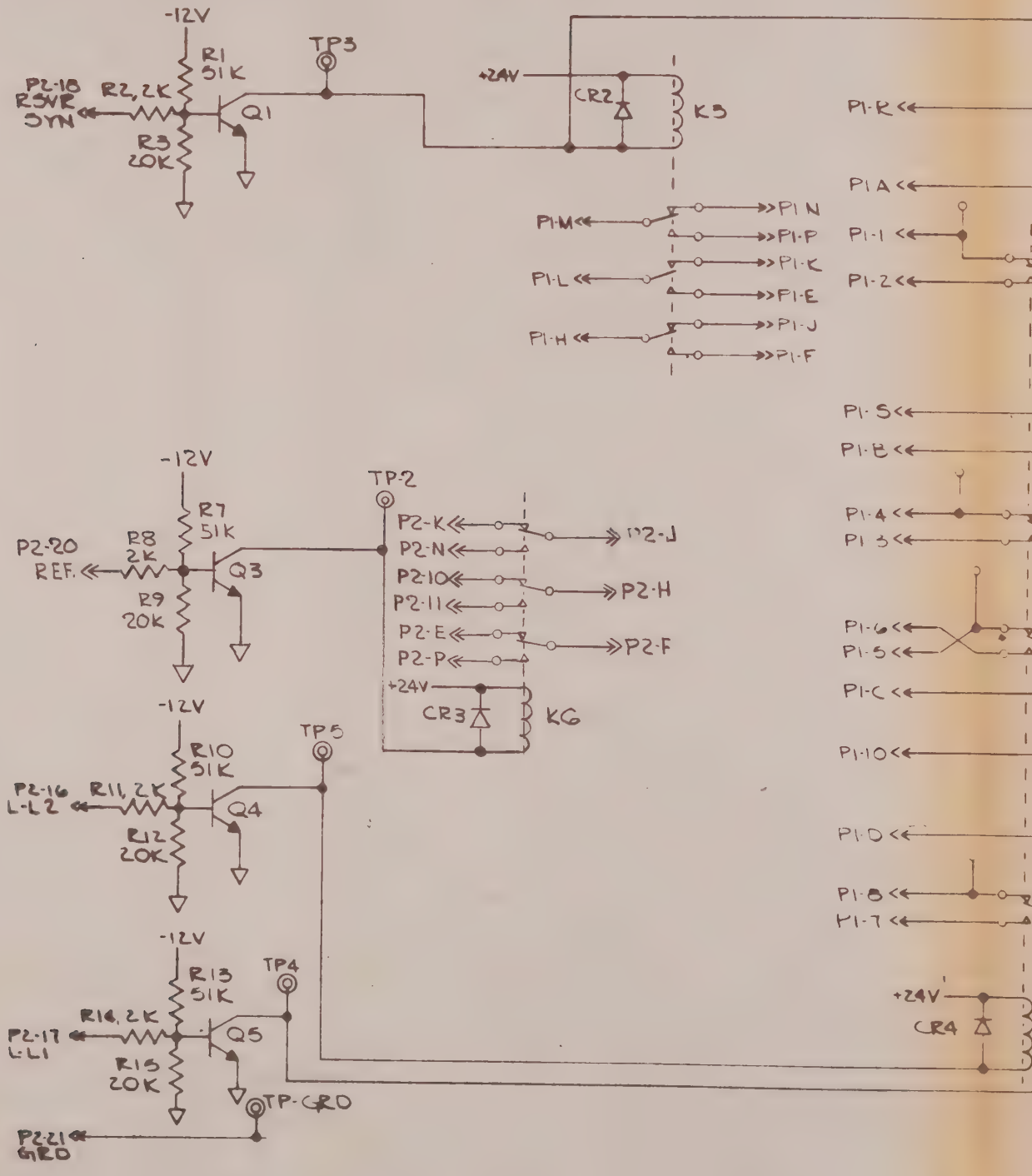
SCHEMATIC
INTERPOLATION
A 134


P1
F
Z
Y
TP3
TP1
TP5
TP2
TP4
RA2
$\overline{RA2}$
$\overline{RA1}$
1/4Z1
1/6Z2

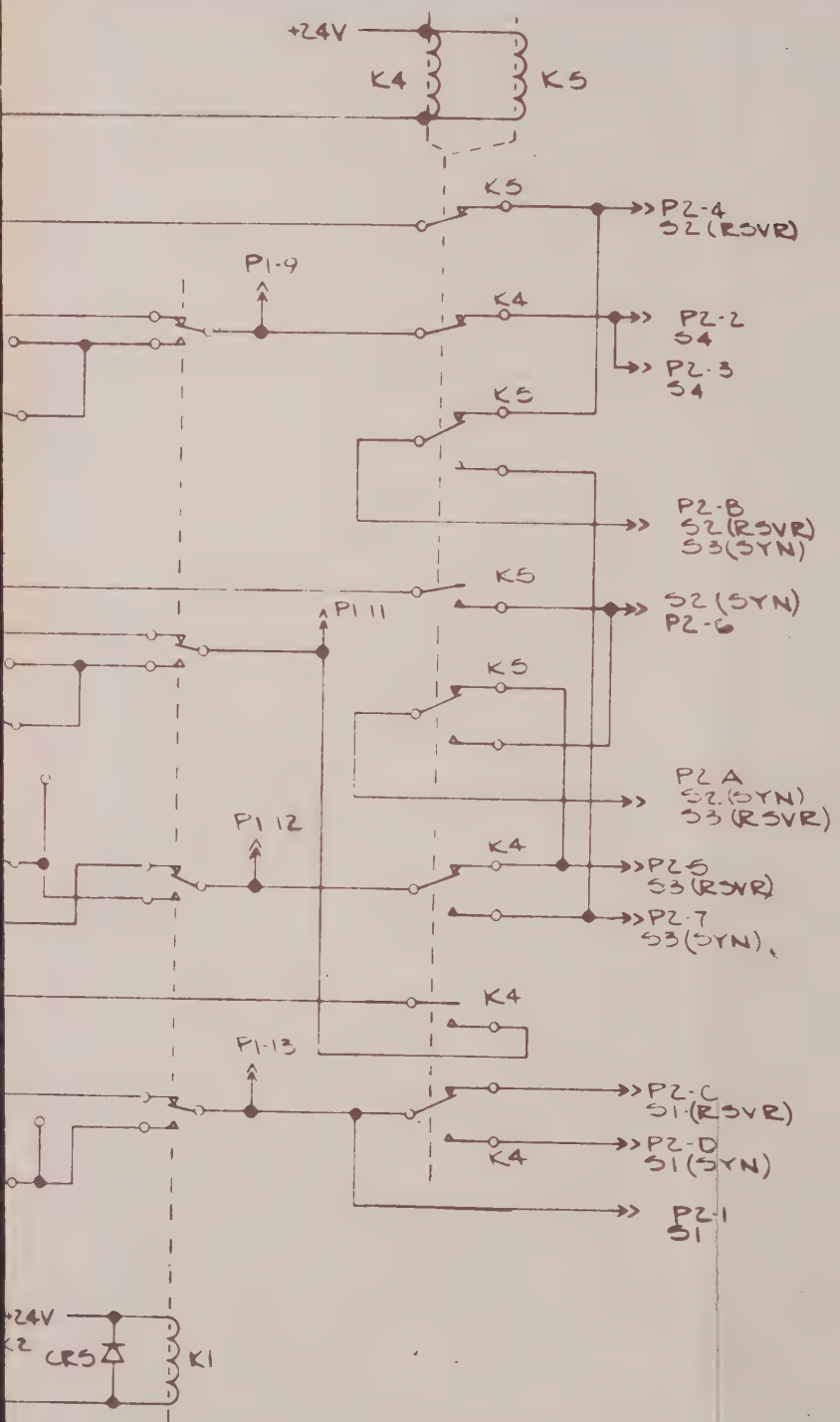

D
E
A
C
B
+5V
L1
33μh
LOGIC GND
+4V
-12V
SW GND
C1
.056 80V
C2
C3
TO Z1, Z2, Z5, Z7
TO Z1, Z2, Z5, Z7
TO Z5, Z7
TO Z5, Z7
TO Z5, Z7



SCHEMATIC
INTERPRETATION
B1

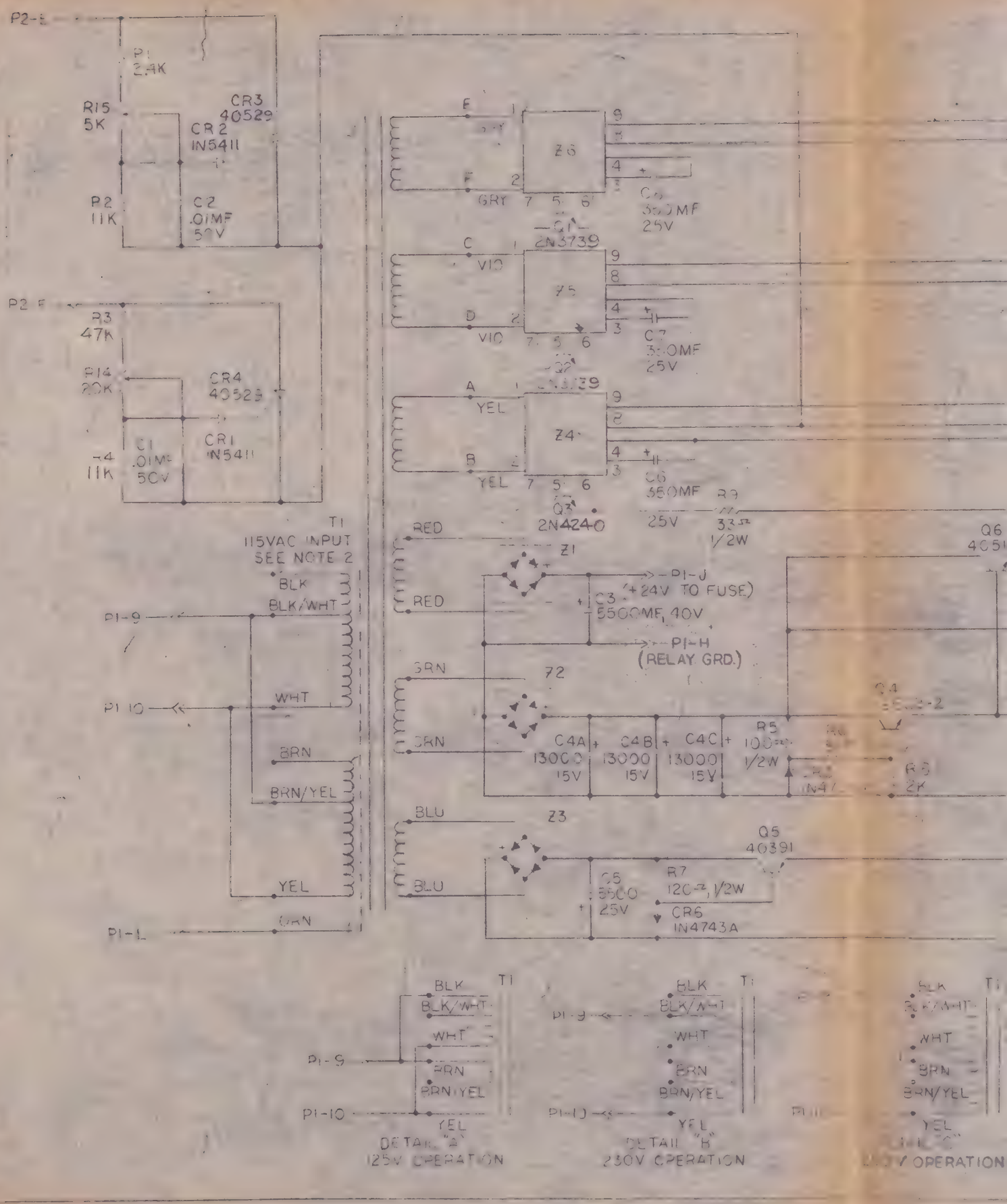


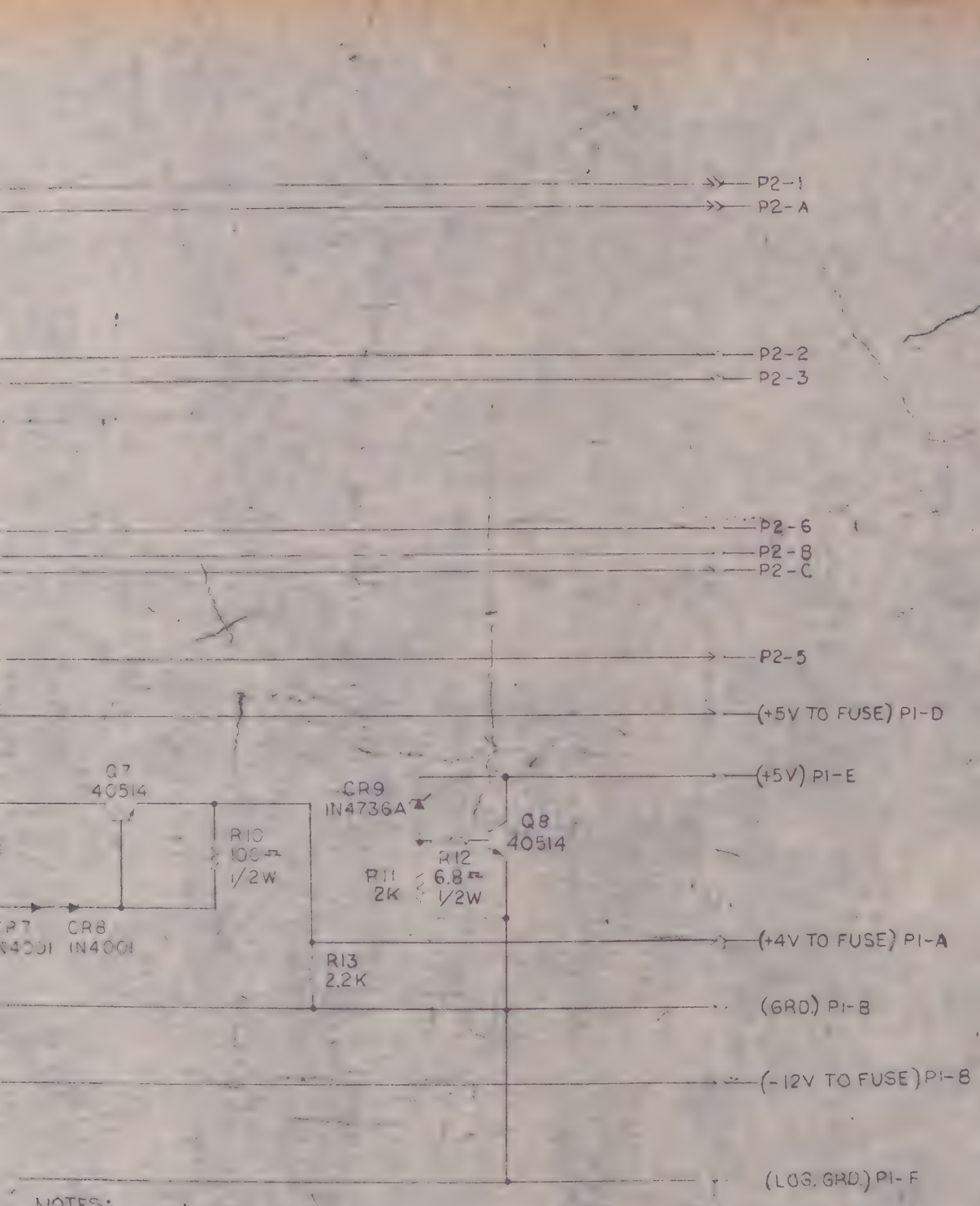
NOTE:
UNLESS OTHERWISE S
ALL DIODES ARE
ALL TRANSISTORS A
K1, K2 - PRINTACT 24 - BW
K3 - K5 PRINTACT 24 -



RECIFIED
14001
RE MP56551
4 - G
W3 - G

SCHEMATIC
MODE PROGRAMMING
BOARD


P2-E
P1
2.4K
R15
5K
CR3
40529
CR2
IN5411
P2
11K
C2
.01MF
50V
P2-F
R3
47K
R14
20K
CR4
40529
C1
.01MF
50V
CR1
IN5411
T1
115VAC INPUT
SEE NOTE 2
BLK
BLK/WHT
P1-9
WHT
P1-10
BRN
BRN/YEL
YEL
GRN
P1-L
E
F
GRY
Z6
C
VIO
D
VIO
Z5
A
YEL
B
YEL
Z4
Q1
2N3739
Q2
2N3739
Q3
2N4240
C6
350MF
25V
C7
350MF
25V
R9
33Ω
1/2W
RED
Z1
RED
P1-J
(+24V TO FUSE)
C3
5500MF, 40V
P1-H
(RELAY GRD.)
GRN
Z2
GRN
C4A
13000
15V
C4B
13000
15V
C4C
13000
15V
R5
100Ω
1/2W
Q4
BLU
Z3
BLU
C5
5500
25V
R7
120Ω, 1/2W
CR6
IN4743A
Q5
40391
Q6
4051
T1
BLK
BLK/WHT
WHT
BRN
BRN/YEL
YEL
P1-9
P1-10
DETAIL "A"
125V OPERATION
DETAIL "B"
230V OPERATION



NOTES:

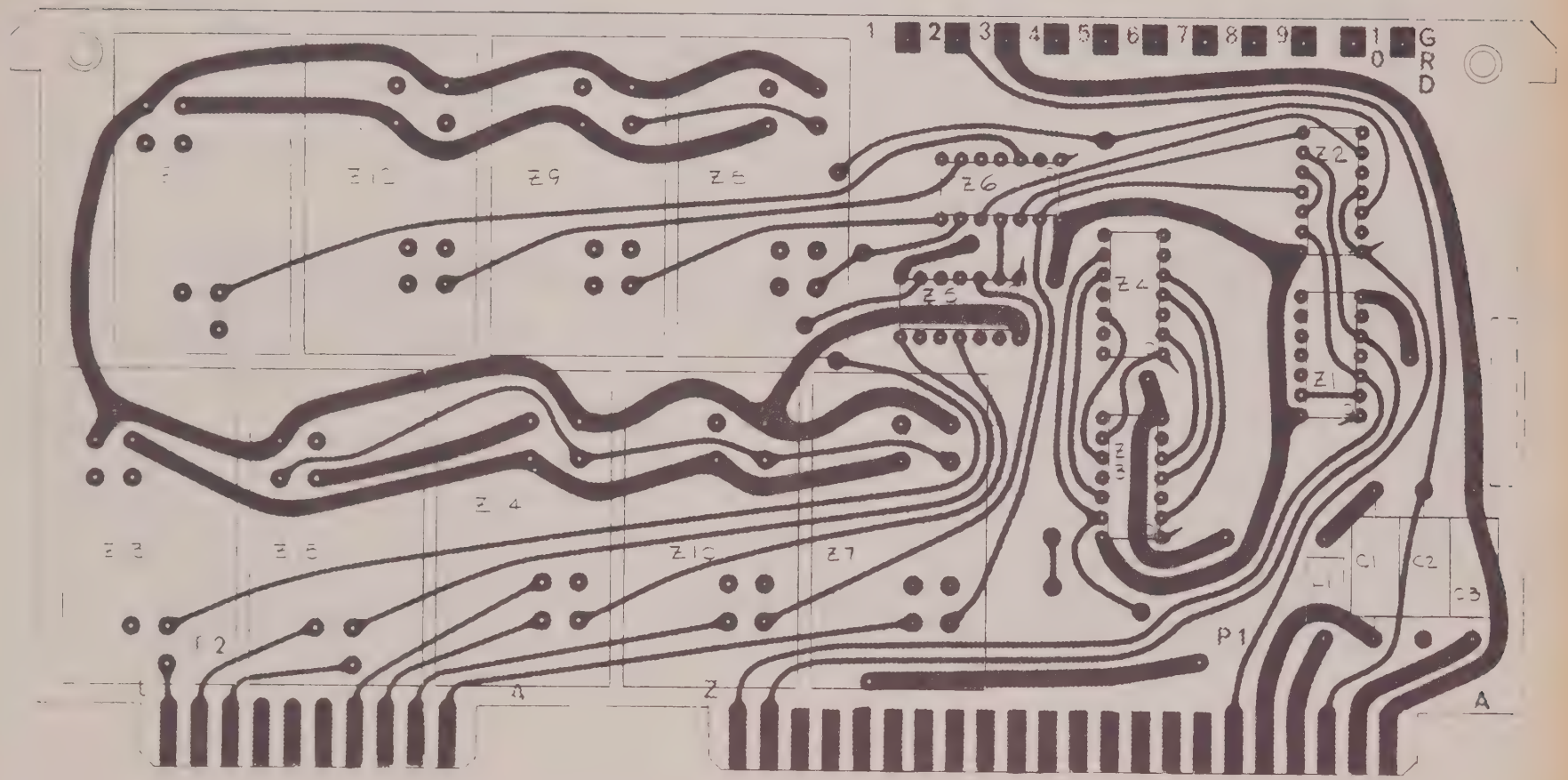
1- UNLESS OTHERWISE SPECIFIED ALL RESISTORS ¼W ±5%.

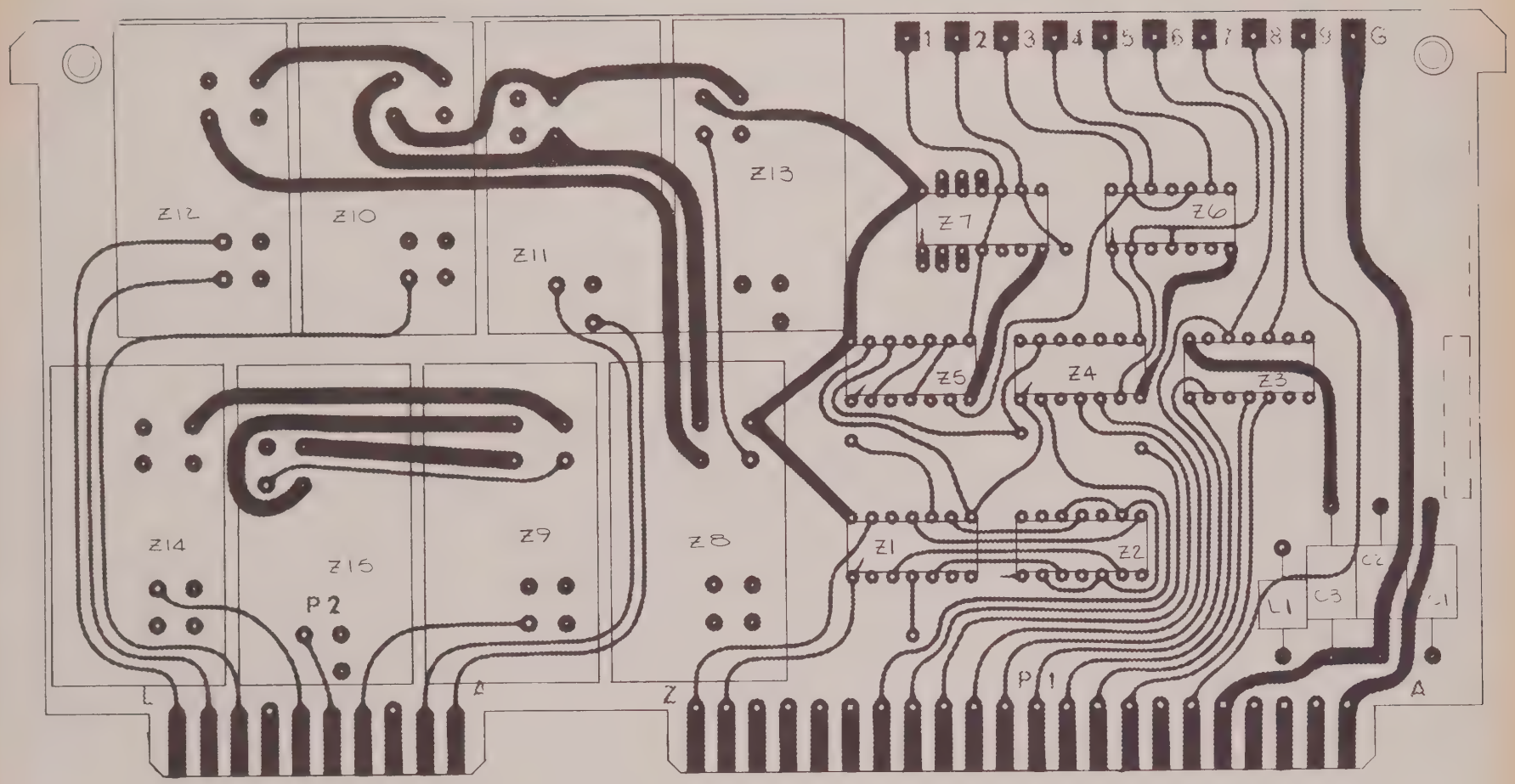
2- T1 PRIMARY WIRING SHOWN FOR 115VAC OPERATION. FOR OTHER THAN 115VAC OPERATION REFER TO DETAILS "A" "B" & "C".

SCHEMATIC 45-420Hz
POWER SUPPLY

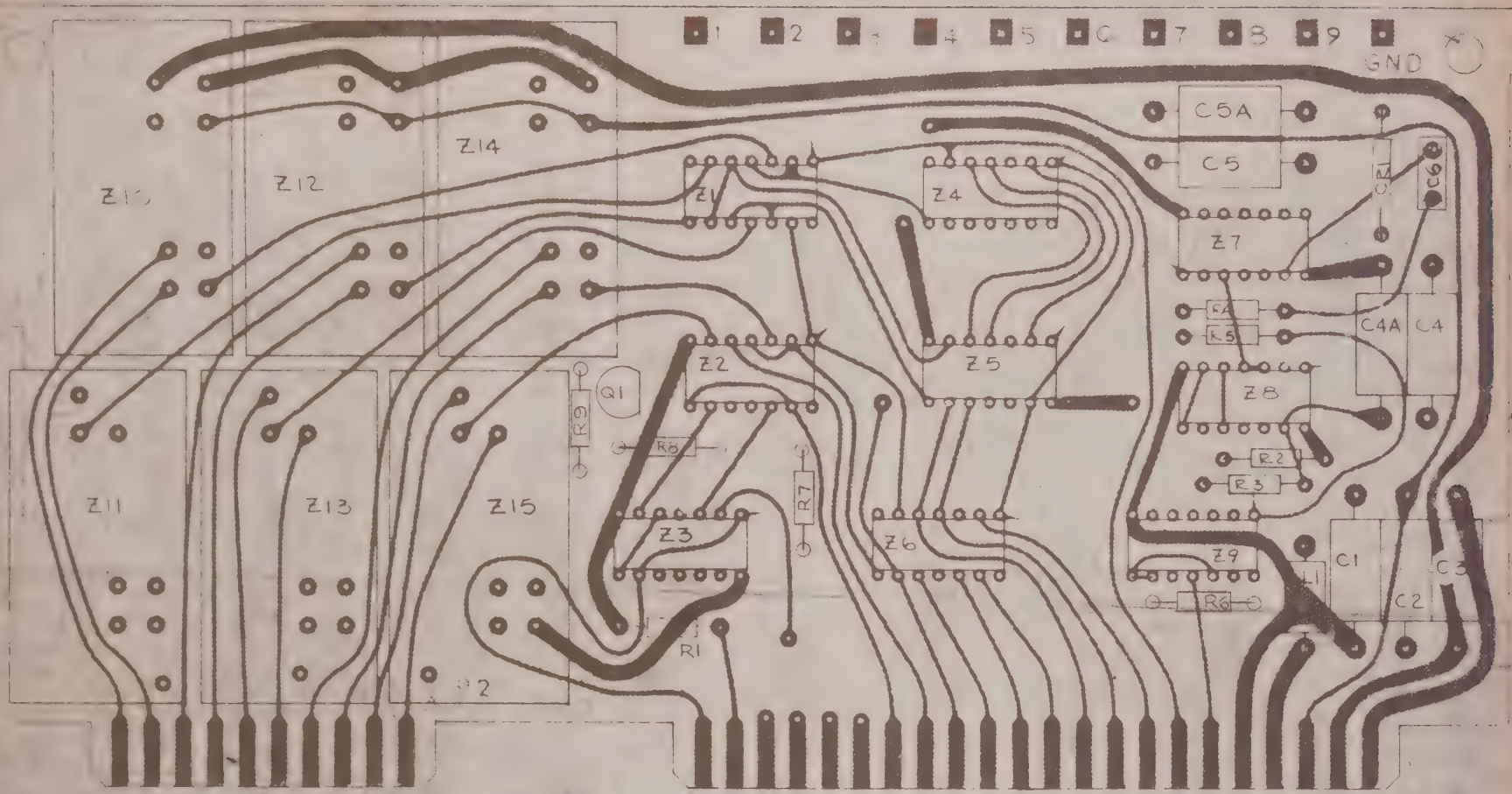
SECTION VIII

ASSEMBLIES


1
2
3
4
5
6
7
8
9
10
GRD
Z1
Z2
Z3
Z4
Z5
Z6
Z7
Z8
Z9
Z10
C1
C2
C3
P1
A

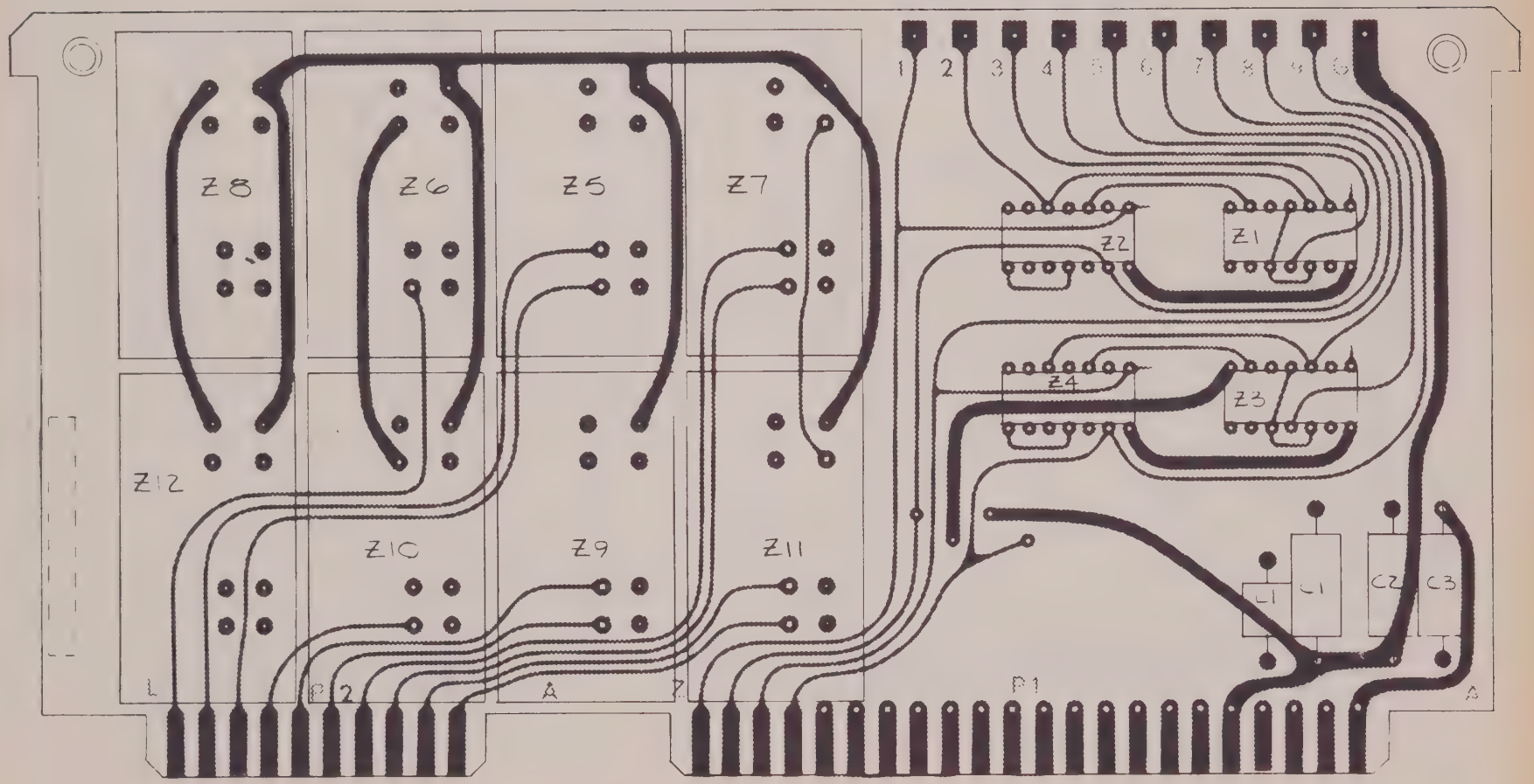


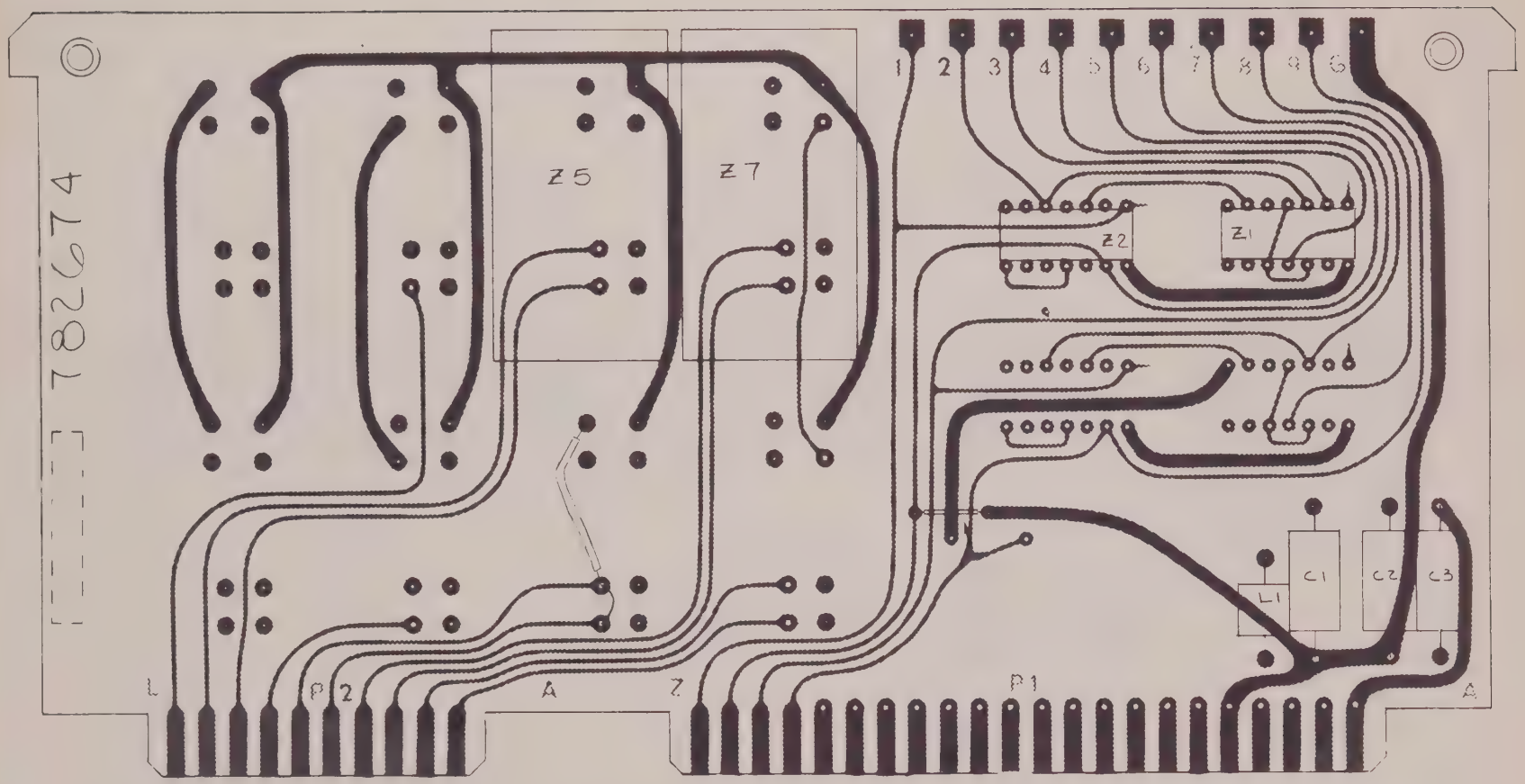
TRIG B
ASSEMBLY

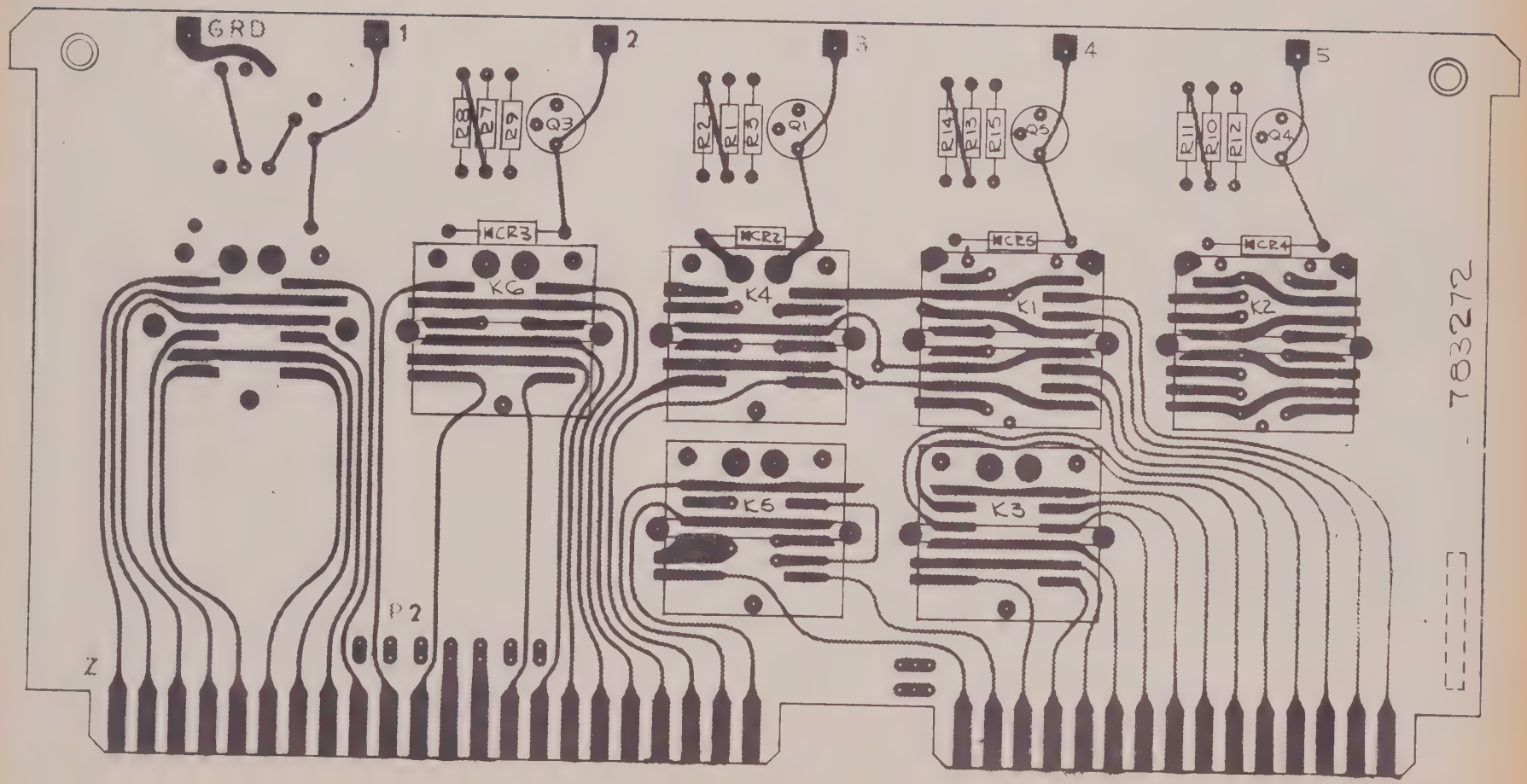


ASSEMBLY
TRIG "C"

A-100646

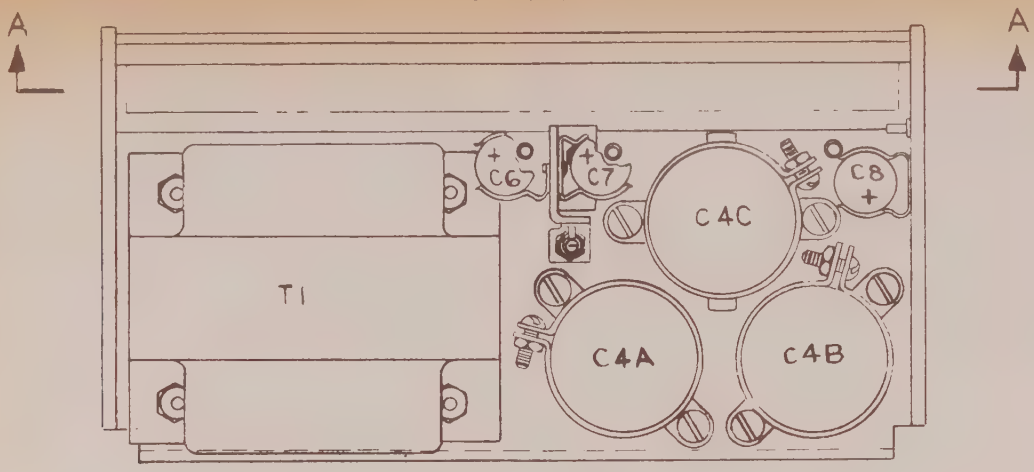

Z8
Z6
Z5
Z7
Z12
Z10
Z9
Z11
Z2
Z1
Z4
Z3
C1
C2
C3
P1
P2

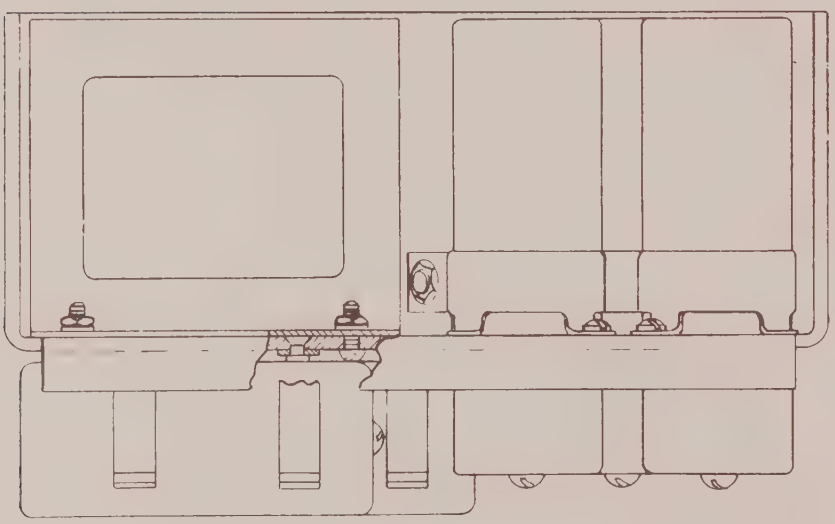

782674
Z5
Z7
Z2
Z1
C1
C2
C3
L1
1
2
3
4
5
6
7
8
9
0
P2
A
Z
P1
A

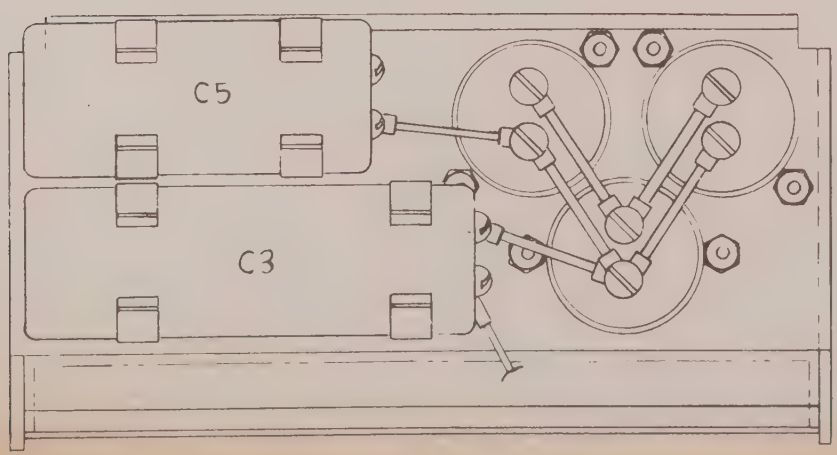


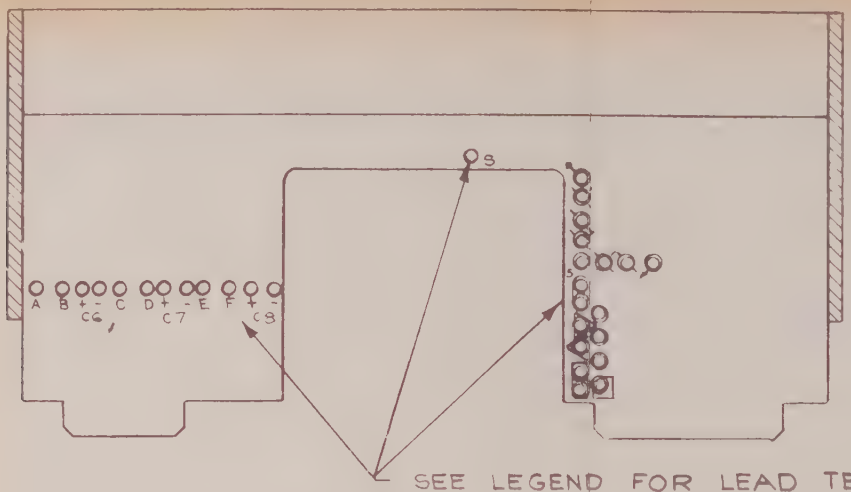
MOLE PROGRAMMING
ASSEMBLY

A-101162


A
A
C6
C7
C8
+
C4C
T1
C4A
C4B

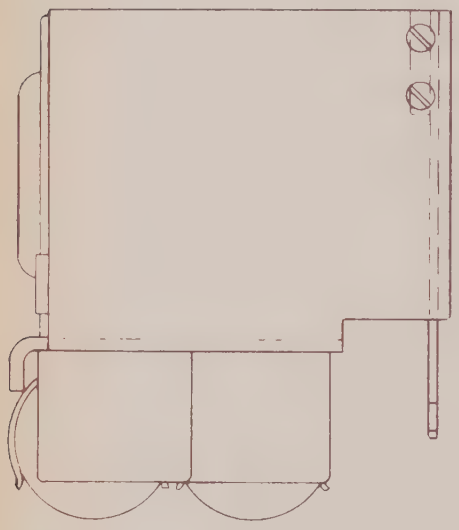



C5
C3



SEE LEGEND FOR LEAD TERMINATION

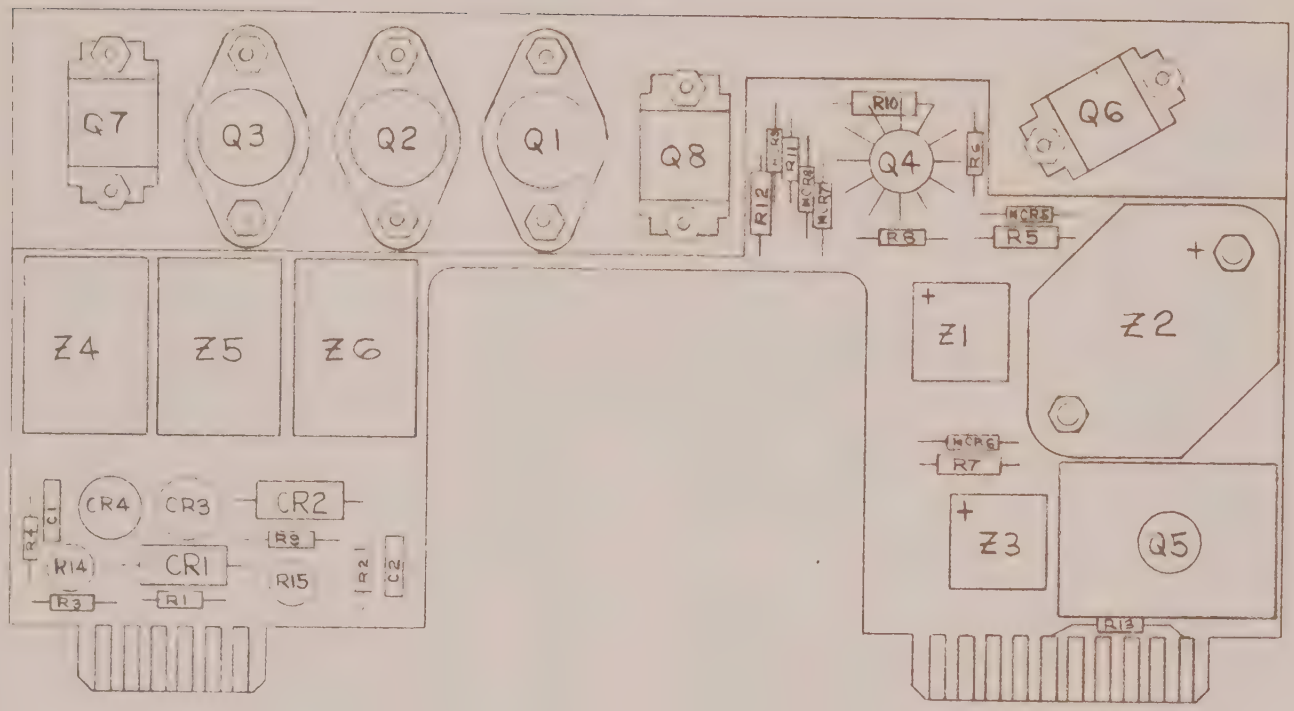
SECTION A-A



LEGEND					
P.C. CARD TERMINAL MARKING		LEAD IDENTIFICATION			
		115V	125V	230 V	250V
◻		T1-WHT	T1-WHT	T1-YEL	T1-YEL
■		T1-YEL	T1-YEL		
◁		T1-BLK/WHT	T1-BLK	T1-BLK/WHT	T1-BLK
▷		T1-BRN/YEL	T1-BRN		
◯				T1-WHT	T1-WHT
◯				T1-BRN/YEL	T1-BRN
S		T1-BLK	T1-BLK/WHT	T1-BLK	T1-BLK/WHT
S		T1-BRN	T1-BRN/YEL	T1-BRN	T1-BRN/YEL
◻		T1-ORN			
○		T1-BLUE			
○		T1-BLUE			
○		T1-GRN			
○		T1-GRN			
○		T1-RED			
○		T1-RED			
○		C4A, C4B, C4C - POSITIVE TERM			
○		C5 - NEGATIVE TERM			
○		C3 - POSITIVE TERM			
○		C5 POS. TERM C3 C4A, C4B, C4C NEG. TERM.			
A		T1-YEL			
B		T1-YEL			
C6	+	C6 - POSITIVE			
	-	C6 - NEGATIVE			
C		T1-VIO			
D		T1-VIO			
C7	+	C7 - POSITIVE			
	-	C7 - NEGATIVE			
E		T1-GRY			
F		T1-GRY			
C8	+	C8 - POSITIVE			
	-	C8 - NEGATIVE			

POWER SUPPLY ASSY
45-420 Hz

NORTH ATLANTIC industries, inc.
100744



POWER SUPPLY CARD ASSEMBLY

WARRANTY

A. North Atlantic Industries, Inc. warrants the Product(s) against defects in material and workmanship for one year from the date of original shipment. The Seller's liability is limited to the repair or replacement of the Product(s) which proves to be defective during the Warranty period.

B. North Atlantic Industries, Inc. specifically excludes from the Warranty,

1) Fuses and electron tubes.

2) Mechanical wear associated with normal operation of the Product(s). Life characteristics of mechanical assemblies such as switches, relays, and gear trains are based upon actual operating conditions, and end-of-life can occur within the Warranty period. The Seller's instruction manual or data sheet shipped with the Product(s) will normally notify the Purchaser of life related parts or assemblies.

3) Recalibration of the Product(s).

C. North Atlantic Industries, Inc. is not liable for consequential damages or for any injury or damage to persons or property resulting from the operation or application of the Product(s).

D. The Warranty is voided if there is evidence that the Product(s) has been operated beyond its design range, improperly maintained or physically mistreated.

E. In the event of malfunction in the Product(s) under Warranty, the Purchaser should notify the Seller's local Sales Representative or the Seller's Marketing Services Department giving full details of the defect and providing the model and serial number (if applicable) of the Product(s). Service data, corrective action, or shipping instructions will be forwarded promptly. There is no charge for Warranty repair of the Product(s) except for transportation charges. However, the Purchaser shall be responsible for the Product(s) shipped until received by the Seller.

NORTH ATLANTIC *industries, inc.*
200 terminal drive, plainview, n. y. OVerbrook 1-8600

F. North Atlantic Industries, Inc. reserves the right to make changes and improvements to the Product(s) without any liability for incorporating such changes or improvements in any Product(s) previously sold, or for any notification to the Purchaser prior to shipment. In the event the Purchaser should require subsequently manufactured lots of the Product(s) to be identical to the equipment delivered in this order, the Seller will, upon written request, provide a quotation upon a change control program.

G. No other Warranty expressed or implied is offered by the Seller other than the foregoing.

CLAIMS FOR DAMAGE IN SHIPMENT

The purchaser should inspect and functionally test the Product(s) in accordance with the instruction manual as soon as it is received. If the product is damaged in any way, including concealed damage, a claim should be filed immediately with the carrier, or, if insured separately, with the purchaser's insurance company.

SHIPPING

On products to be returned under warranty, await receipt of shipping instructions, then forward the instrument prepaid to the destination indicated. The original shipping containers with their appropriate blocking and isolating material is the preferred method of packaging. Any other suitably strong container may be used providing the product is wrapped in heavy paper or a plastic bag and surrounded with at least four inches of shock absorbing material to cushion firmly, preventing movement inside the container.

WARRANTY REGISTRATION

Please complete and mail this Warranty Registration Card without delay. Placing this Registration on file with our Service Department will assure that you receive applicable service data as issued. No postage is required. (Mailed on_____ by_____)

WARRANTY REGISTRATION

Date _____

Please register _____

Model No. _____ Serial No. _____

under the terms of the warranty stated in this Instruction Manual.

Name _____

Title _____ Dept. _____

Company _____

Address _____

City _____ State _____ ZIP _____

Calibration and maintenance responsibility has been assigned to the following person and/or department. Address applicable service data to (if same as above, please state):

Name _____

Title _____ Dept. _____

For our information please indicate:

Condition of instrument on receipt _____

Application _____

Will the instrument be: resold as part of a system? _____

maintained as company equipment? _____

SERVICE INFORMATION

This card is provided to aid you in obtaining prompt assistance with questions you may have regarding operation, calibration, maintenance or service parts for your North Atlantic instrument. State information desired and mail. No postage is required.

SERVICE INFORMATION REQUEST

Instrument _____

Model No. _____ Serial No. _____

We require the following service information: _____

_____

_____

_____

_____

Name _____ Title _____

Company _____ Dept. _____

Address _____

City _____ State _____ ZIP _____

Phone _____ Ext. _____

SERVICE INFORMATION

This card is provided to aid you in obtaining prompt assistance with questions you may have regarding operation, calibration, maintenance or service parts for your North Atlantic instrument. State information desired and mail. No postage is required.

SERVICE INFORMATION REQUEST

Instrument _____

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We require the following service information: _____

_____

_____

_____

_____

Name _____ Title _____

Company _____ Dept. _____

Address _____

City _____ State _____ ZIP _____

Phone _____ Ext. _____

(please send additional Service Information Request cards _____

No Postage Stamp Necessary If Mailed in the United States

Postage Will be Paid by Addressee

BUSINESS REPLY MAIL

First Class Permit No. 505, Sec. 34.9, P.L.&R. Hicksville, L. I., N. Y.

NORTH ATLANTIC
industries, inc.

200 TERMINAL DRIVE,

PLAINVIEW, N. Y. 11803

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NORTH ATLANTIC
industries, inc.

200 TERMINAL DRIVE,

PLAINVIEW, N. Y. 11803

SALES OFFICES

ALABAMA
BCS ASSOCIATES, INC.
Huntsville: 205-881-6220

ARIZONA
TECHNICAL CONSULTANTS
Phoenix: 602-266-7422

CALIFORNIA
NORTH ATLANTIC DISTRICT OFFICE
North Hollywood: 213-982-0442

CONNECTICUT
J & J ASSOCIATES
Hamden: 203-624-7800

DISTRICT OF COLUMBIA
DYNA REP CO.
Washington: 703-321-8630

FLORIDA
BCS ASSOCIATES, INC.
Orlando: 305-896-4881
Fort Lauderdale: 305-735-7641

GEORGIA
BCS ASSOCIATES, INC.
Atlanta: 404-874-9925

ILLINOIS
PAT LIND ELECTRONICS CO.
Chicago: 312-774-1246

KANSAS
TECHNICAL REPRESENTATIVES, INC.
Merrian: 913-432-4110

MARYLAND
DYNA REP CO.
Baltimore: 301-879-2586

MASSACHUSETTS
J & J ASSOCIATES
Burlington: 617-272-2606

MICHIGAN
SCIENTIFIC DEVICES–MIDWEST
Franklin: 313-851-5945

MINNESOTA
PAT LIND ELECTRONICS CO.
Circle Pines: 612-786-5770

MISSOURI
TECHNICAL REPRESENTATIVES, INC.
Hazelwood: 314-524-6900

NEW MEXICO
SYSTEM DESIGN CONSULTANTS
915-544-7076

NEW YORK
NORTH ATLANTIC INDUSTRIES, INC.
Plainview: 516-681-8600

NORTH CAROLINA
BCS ASSOCIATES, INC.
Greensboro: 919-273-1918

OHIO
SCIENTIFIC DEVICES–MIDWEST
Dayton: 513-298-9904
Cleveland: 216-261-2000

PENNSYLVANIA
SCIENTIFIC MARKETING, INC.
Exton: 215-363-7377

TEXAS
SCIENTIFIC SALES CO.
Richardson: 214-231-6541
Houston: 713-781-2711

SYSTEM DESIGN CONSULTANTS
El Paso County only: 915-544-7076

VIRGINIA
BCS ASSOCIATES, INC.
Williamsburg: 703-245-1786

DYNA REP CO.
Springfield: 703-321-8630

WASHINGTON
SCIENTIFIC DEVICES NORTHWEST, INC.
Bellevue: 206-454-0900

WISCONSIN
PAT LIND ELECTRONICS CO.
Milwaukee: Enterprise 1611

AUTHORIZED SERVICE CENTERS

CALIFORNIA
ELECTRICAL STANDARDS REPAIR SERVICE INC.
North Hollywood: 213-765-4224

FLORIDA
BCS ASSOCIATES, INC.
Orlando: 305-896-4881

INTERNATIONAL SALES REPRESENTATIVES

AUSTRALIA
RONALD J. T. PAYNE PTY. LTD.
Richmond, Victoria: 42-1416

BELGIUM
C. N. ROOD, S.A.
Brussels: 02-35.2135

CANADA
JOHN DE GROOT ASSOCIATES
Scarborough, Ontario: 416-264-2991

FRANCE*
TECHNITRON, S.A.
Paris: 527-49.65

GERMANY*
TECHNITRON, G.m.b.H.
Munich: 695801

HOLLAND
C. N. ROOD, N.V.
Rijswijk: The Hague 99.63.60

ISRAEL
RACOM ELECTRONICS CO., LTD.
Tel-Aviv: 443126

ITALY
MOTORDIESEL
LaSpezia: 36.232

JAPAN
SEKI & COMPANY, LTD.
Tokyo: 699-4121
Osaka: 531-3813

SWEDEN
AJGERS ELEKTRONIK AB
Stockholm: 08/46 42.46

SWITZERLAND
NUCLETRON AG
Lausanne: 252423

UNITED KINGDOM
AVELEY ELECTRIC, LTD.
Surrey: 01-397-8771

ALL OTHER COUNTRIES
Contact Factory, Cable: NOATLANTIC

*New York Office: Technitron, Inc.: 212-758-2790

To ease maintenance and troubleshooting of its instruments, North Atlantic Industries manufactures a line of Extender Cards.

Below is a list of standard instruments and their recommended Extender Cards. Following the instrument list, is a price list. Please contact the factory for information on any instrument not listed.

INSTRUMENT	EXTENDER CARD PART NUMBER
Model 212 Phase Angle Voltmeter	782697-3
Model 214 Phase Angle Voltmeter	782697-3
Model 240 Phase Angle Voltmeter	782697-3
Model 245 Phase Angle Voltmeter	782697-3
Model 351 Phase Calibrator	782900
Model PSC-419 Phase Sensitive Converter	782900
Model 508/10 Digital-to-AC Converter	782697-1
	782697-2
	782697-4
	802697-3
Model 536 Digital-to-Resolver Converter	782697-1
	782697-2
	782697-3
	782697-4
Model 537/10 Digital-to-Synchro Converter	782697-1
	782697-2
	782697-4
Model 538/10 Digital-to-Resolver/Synchro Converter	782697-1
	782697-2
	782697-3
	782697-4

INSTRUMENT	EXTENDER CARD PART NUMBER
Model 545 Angle Position Indicator	782697-1 782697-3 782697-4 782697-6
Model 545/100 Angle Position Indicator	782697-2 (2 req.) 782697-5 (2 req.) 782697-4
Model 546/20 Synchro-to-Digital Converter	782697-5 (2 req.) 782697-2
Model 660 Digital Angle Generator	782900
Model API-8025 Angle Position Indicator	782697-3
Model 8525 Angle Position Indicator	783237

EXTENDER CARD PART NUMBER	NUMBER OF PINS *	PRICE
782697-1	12 Pin	$20.00
782697-2	20 Pin	20.00
782697-3	30 Pin	20.00
782697-4	44 Pin	20.00
782697-5	36 Pin	20.00
782697-6	56 Pin	20.00
782900	44 Pin (Split)	30.00
783237	(Split-Right Angle)	40.00

* All printed circuit edge type connectors.

CME FILE
PLEASE RETURN